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FROM THE EDITOR

This is the inaugural bimonthly issue of *AMJ*. Thus, with this issue, you will receive an issue of *AMJ* every two months to a total of six issues per year. This is an important change for *AMJ* because it allows us to publish more articles and to move them to print faster once they have been accepted. For example, we will publish more articles in *AMJ* in 1992 than at any time in the past. Additionally, with the movement from five to six issues, 1993 will represent the largest number of articles published in *AMJ* since its inception. Furthermore, the addition of new issues has allowed us to reduce the average time from acceptance to publication to approximately nine months. Our goal is to reduce this average time even more. As a result, the change in number of issues allows us to provide better service to the members of the Academy of Management, authors of work published in *AMJ*, and our readers.

I also want to call your attention to the Calls for Papers for the Special Research Forums on Methodology and Configurational Research that are again published herein. The deadline for submission of manuscripts for these Special Research Forums is September 1, 1992. Therefore, the deadline is drawing close. If you have work that fits one of these Special Research Forums and it is at an appropriate stage, we encourage you to submit a manuscript to be reviewed for publication in *AMJ*. Our goal is to publish these forums in the December 1993 issue, as explained previously.

Lastly, I continue to welcome the submission of manuscripts to be considered for publication in *AMJ*. We review and publish work in multiple subdisciplines, representing all divisions within the Academy of Management. If you, as a reader or potential author, have questions, please feel free to contact me. We hope that you continue to consider the *Academy of Management Journal* as a primary outlet for your scholarly empirical research in management and that you continue to utilize and read *AMJ* as a medium for cutting-edge research in our field.

Michael A. Hitt

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INTEGRATED MANUFACTURING AND HUMAN RESOURCE MANAGEMENT: A HUMAN CAPITAL PERSPECTIVE

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This study examined the relationship between integrated manufacturing, defined as the use of advanced manufacturing technology (AMT), just-in-time inventory control (JIT), and total quality management (TQ), and human resource management from a human capital perspective. Data from managers and nonmanagers showed several direct and interactive effects. AMT was positively related to selective staffing, comprehensive training, developmental appraisal, and externally equitable rewards for operations employees and to selective staffing for quality employees. TQ was positively related to these same human resource practices in quality and was also related to the comprehensiveness of training for operations employees. JIT was negatively related to selective staffing in operations and to performance appraisal in quality and positively related to staffing in quality. The two- and three-way interactions had negative effects.

One of the most pressing challenges facing firms in today's business environment is the transformation to a new paradigm for manufacturing (*Business Week*, 1986; Drucker, 1990; *The Economist*, 1986). Although the changes in manufacturing originally centered on the implementation of advanced technology, their scope has expanded to other issues, such as strategy (Hayes, Wheelright, & Clark, 1988), quality assurance (Harrington, 1987), inventory control (Klein, 1991), and job design (Dean & Snell, 1991). Many theorists have stated that companies need to cross the threshold to this new paradigm to compete in the era of modern manufacturing (cf. Jaikumar, 1986).

Interestingly, a good deal of evidence suggests that the failure of some firms to make this transition is due to the mismanagement of people rather than to problems with technical systems per se (Ettlie, 1988; Majchrzak, 1988). In particular, critics have charged that changes in manufacturing of-

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ten are not accompanied by complementary changes in human resource management (Adler, 1988). For example, employees are often managed in ways inconsistent with the use of advanced technology (Buchanan & Bessant, 1985; Jaikumar, 1986; Manufacturing Studies Board, 1986). Human resource management considerations may be even more important for other aspects of modern manufacturing, such as just-in-time inventory control (JIT) (Huang, Rees, & Taylor, 1983; Klein, 1991) and total quality management (Harrington, 1987; Oliver & Davies, 1990). Recognition of this issue is now so widespread that most theorists see human resource management as a critical link in the conversion to the modern manufacturing paradigm (Hayes et al., 1988; Majchrzak, 1986; Monden, 1983).

This overall theme is consistent with a long history of research on the interaction of technology and organization that has investigated such issues as sociotechnical systems and structural contingency theory. Little empirical research has, however, investigated the design of human resource management practices in an advanced manufacturing environment. Research to date has relied mainly on case studies, which have frequently presented idiosyncratic or conflicting findings (cf. Majchrzak, 1988; Manufacturing Studies Board, 1986). For example, some studies (e.g., Helfgott, 1988; Kern & Schumann, 1990) have suggested that firms upgrade employee skills when implementing new technologies, while others (e.g., Butera & Thurman, 1984; Gerwin & Tarondeau, 1982; Shaiken, 1984) have suggested just the opposite—that some firms use new technology to "minimize the need for skills and to diminish worker decision making" (Majchrzak, 1988: 56).

The purpose of our study was to empirically test theory that links human resource management with different levels and types of advanced manufacturing systems. If scholars hope to draw generalizable conclusions about the match between these aspects of organizations, more systematic analysis of data drawn from a variety of firms and jobs is needed. The present article is organized as follows. First, we use human capital theory as a lens for discussing why firms vary in their orientations to human resource management. Next, we present the concept of integrated manufacturing and develop hypotheses relating it to human capital and human resource management. Finally, we discuss the results of an empirical study investigating the direct and interactive effects of integrated manufacturing on human resource management.

THEORETICAL FRAMEWORK

Human Resource Management: Investment in Human Capital

The premise of this study was that human resource management practices constitute investments in human capital (cf. Flamholtz & Lacey, 1981; Perry, 1991). The concept of human capital is that people possess skills, experience, and knowledge that have economic value to firms. Although the theory was originally developed to study the economic value of education (Schultz, 1960), more recently it has been applied to selection, training, compensation, and human resource management practices in general (Cascio, 1991; Flamholtz & Lacey, 1981; Parnes, 1984; Wallace & Fay, 1988). As Parnes noted:

> It is but a short intellectual hop from the concept of human resources to the economist's concept of human capital, for that term refers to the productive capabilities of human beings. More precisely, human capital embraces the abilities and know-how of men and women that have been acquired at some cost and that can command a price in the labor market because they are useful in the productive process (1984: 32).

There are several parts to this definition. First, skills and knowledge represent capital because they enhance productivity. In other words, people add value to a firm to the extent that they will perform future services (Parnes, 1984). Some of this value is added directly by transforming the firm's product, but much of it is less tangible, consisting of solving problems, coordinating the work of departments, and exercising judgment in novel situations.

Second, human capital is the result of a firm's making a deliberate investment either through hiring certain individuals "on the market" or developing them in-house. These investments, via human resource management, carry both out-of-pocket and opportunity costs, and are justified only if they produce future returns via increased productivity (Duncan & Hoffman, 1981; Rumberger, 1987; Tsang, 1987). Since firms are likely to undertake additional investments up to the point at which the marginal cost equals the marginal return, the value of human capital investments depends on the contribution of employees to a firm. The higher the potential for employee contribution, the more attractive human capital investments will be (Becker, 1976; Parnes, 1984). Alternatively, investments in employees that cannot be used produce surplus human capital that may be very costly to a firm (Tsang, Rumberger, & Levin, 1991).

Third, human capital commands a price on the market because it is valuable to other firms and, perhaps more important, it is transferable (Parnes, 1984). This transferability is a critical difference between human capital and physical capital. Firms do not actually "own" human capital—it is embodied in employees, who are free (within limits) to move from one firm to another (Becker, 1964; Jacoby, 1991). Even if employees stay with a firm, their contribution depends on their willingness to perform. Therefore, control costs, or costs of retaining and motivating employees (such as wages), must be considered human capital investments as well (Flamholtz & Lacey, 1981).

If human resource management practices are seen as investments in human capital, how are they affected by the changing nature of manufacturing? To answer this question, it is important to realize that human capital becomes economically valuable when manifested in performance. Employees are not valuable in the abstract, but rather as a function of the jobs they perform (Flamholtz, 1979). Thus, if two employees are equally skilled, the one who uses more of these skills on the job is more valuable to a firm. Similarly, if two employees are each given the same training, the increase in human capital is greater for the individual who uses more of the new skills on the job. Thus, the value of human capital investments depends on the demands placed upon employees. As discussed below, these demands will likely increase substantially under the new manufacturing paradigm.

Integrated Manufacturing

Integrated manufacturing involves the elimination of barriers between stages, functions, and goals of production to create a streamlined value-added system (Dean & Snell, 1991). Three prominent innovations compose integrated manufacturing: advanced manufacturing technology, just-in-time inventory control, and total quality management (Gunn, 1987; Mortimer, 1985; Schonberger, 1986). These three practices work in concert to change the way goods are produced; in fact, their joint application has dramatically transformed the entire manufacturing function (Gunn, 1987).

Advanced manufacturing technology. Advanced manufacturing technology (AMT), the manufacturing subset of information technology (Lund & Hansen, 1986), includes a variety of computerized technologies, such as computer-aided manufacturing (CAM) and process planning (CAPP). These technologies can be combined into various types of integrated systems, such as flexible manufacturing systems (FMS) and computer-integrated manufacturing systems (CIM). This potential for integration is among the distinguishing features of AMT (Child, 1984; Mortimer, 1985). Descriptions of the specific technologies that compose AMT can be found in Gunn (1987), Helfgott (1988), Majchrzak (1988), and Dean and Susman (1989).

Just-in-time. Just-in-time inventory control (JIT) is a set of practices for reducing lead time and inventory. Its name derives from the practice of receiving or producing each raw material or subcomponent just in time for it to be used in the next step of production. Some of the most important JIT practices are product simplification through parts reduction, frequent deliveries from a limited number of suppliers, small lot sizes, set-up time reduction, factory layout by product families, and consistent preventive maintenance (Gunn, 1987; Monden, 1983; Sakakibara, Flynn, & Schroeder, 1990; Schonberger, 1986). JIT is often associated with "kanban" systems, in which inventory is replenished only when existing inventory has been depleted. (A kanban is a ticket from a container of parts used to reinitiate production once the container is empty.) There is no reason, however, why JIT must operate with such a "pull" system; "push" systems, in which production is generated by a preset schedule, may also be compatible with its objectives (Huang et al., 1983; Karmarkar, 1989).

Total quality management. Total quality management (TQ) is characterized by a few basic principles—doing things right the first time, striving for continuous improvement, and fulfilling customer needs (Harrington, 1987; Schonberger, 1986)—as well as a number of associated practices. For example, firms make quality a major responsibility of employees, work with suppliers to improve the quality of incoming parts, and ensure that their manufacturing processes are capable of consistently high quality. A number of techniques, particularly statistical process control (SPC), are associated with TQ. The specific set of practices used, however, varies across sites (Sullivan, 1986; Taguchi & Clausing, 1990).

AMT, TQ, and JIT can and do work as stand-alone systems, but the concept of integrated manufacturing highlights the fact that they also work interactively to bring together previously independent elements of production (Dean & Snell, 1991; Mortimer, 1985; Schonberger, 1986). To begin with, integrated manufacturing combines the stages of production (Boddy & Buchanan, 1986; Ettlie, 1988). As Gunn described it, integrated manufacturing "consists of the entire range of activities from product and process design through . . . support in the field. This is one continuous spectrum. No activity can be performed along this spectrum without affecting some other part of it either upstream or downstream" (1987: 28–29). Stage integration is facilitated in part by each component of integrated manufacturing. For example, JIT eliminates inventory buffers between stages as well as any steps that do not add value, such as materials handling. The laying out of plants by product families that typifies JIT virtually eliminates the physical distance between successive stages. The TQ principle of doing things right the first time often means eliminating inspections and rework between stages. AMT provides for computer integration, which allows information to be easily fed forward or backward between stages.

Integrated manufacturing also diminishes the separation between functions (Dean & Snell, 1991; Mortimer, 1985; Schmenner, 1988). More specifically, AMT creates electronic links that make information simultaneously available to various functions (e.g., Ettlie, 1988). The problem-solving processes that characterize TQ also engender collaboration across functions—problems are viewed as systemic rather than as isolated in particular departments (Feigenbaum, 1983). Similarly, JIT's focus on lead time reduction involves virtually all of a plant's functions in a joint effort (Schmenner, 1988). Thus, integrated manufacturing is often seen as "break[ing] down traditional departmental barriers" (Mortimer, 1985: 38).

Finally, integrated manufacturing unites the goals of manufacturing in a synergistic relationship (Schonberger, 1986). Managers have traditionally believed that there are trade-offs between the goals of quality, cost, and lead time. But with the advent of integrated manufacturing, these goals support one another. For example, JIT's focus on lead time reduction forces managers to make changes that also improve quality and cost (Schmenner, 1988). Along the same lines, researchers writing about quality (e.g., Crosby, 1979) have long held that, when managed correctly, good quality is less expensive than poor quality. Finally, AMT makes it possible to produce a wide variety of high-quality products at low costs and with short lead times (Susman & Dean, 1989).

In summary, integrated manufacturing ideally involves a streamlined flow of automated, value-added activities, uninterrupted by moving, storage, or rework. All functions are electronically linked, with a common focus on continuous improvement in cost, quality, and lead time. The elimination of barriers is the heart of integrated manufacturing. Advanced technology, just-in-time, and total quality are the means by which it is achieved.

The Nature of Employee Contributions

Each facet of integrated manufacturing can affect the nature of work and the demands placed on employees (cf. Pietro & Schremser, 1987). Historically, automation has been seen as a capitalist instrument for "deskilling" workers and reducing their discretion with programmed systems (Helfgott, 1988: 67). However, there are important differences between the mechanized systems of the past and manufacturing systems today (Ayers & Miller, 1983; Shaiken, 1984). In particular, studies have suggested that aspects of integrated manufacturing require greater technical, conceptual, analytical, and problem-solving skills than did older manufacturing paradigms (Helfgott, 1988; Kern & Schumann, 1990; Schmenner, 1988; Wilkinson, 1983). Conversely, Majchrzak (1986) found that the need for physical skills may actually decrease with the implementation of integrated manufacturing.

In general, these findings represent a trend toward "upskilling" employees into "knowledge workers," whose responsibilities involve problem solving (e.g., Kern & Schumann, 1990; Mortimer, 1985; Zuboff, 1988), rather than "touch laborers," whose responsibilities include only physical work (Walton & Susman, 1987). Research has suggested that skilled workers adapt better than unskilled workers to technological change (Chao & Kozlowski, 1986; Nelson & Phelps, 1966) and are more capable of making allocative decisions (Welch, 1970). Put simply, AMT, JIT, and TQ are sophisticated systems requiring sophisticated workers. Spenner summarized the argument this way: "Technological change increases productivity and in doing so requires a broader variety of skills and higher average skills from the work force. Further, automation eliminates routinized work; workers experience less close supervision and have more responsibility; work is more complex and interrelated" (1983: 824).

Returning now to human capital and human resource management, we suggest that integrated manufacturing increases the skills required of employees, the amount of discretion they must be accorded, and the impact they have on production (Helfgott, 1988; Majchrzak, 1988). As Walton and Susman noted: "In plant after plant we see . . . output is more sensitive to variations in human skills, knowledge and attitudes and to mental effort rather than physical effort" (1987: 99).

Work in an integrated manufacturing environment involves a broader scope of responsibility for decision making, problem solving, and continuous improvement. As Zipkin put it, "the idea is that tighter inventories, shorter supply lines, quality displays and so forth make each worker's contributions essential" (1990: 46). Since, under integrated manufacturing, employees have a greater impact on the finished product—or stated differently, productivity would suffer more if employees performed poorly—the economic impact of labor is higher than it is in the traditional factory (Jaikumar, 1986). The implication of these trends is that the potential contribution of employees in integrated manufacturing settings is greater than it is in the traditional factory, which makes human capital investments more attractive to employers. Assuming managers make capital investments on the basis of expected returns, they will be more likely to invest in employees in an integrated manufacturing environment.

HYPOTHESES

Main Effects of Integrated Manufacturing

Human resource management practices are the primary means by which firms invest in their employees (cf. Cascio, 1991). By extension, different characteristics of human resource management practices reflect different levels of investment in human capital. On the basis of the discussion above, we can derive specific hypotheses regarding staffing, training, appraisal, and rewards.

Selective staffing. One of the most obvious ways firms enhance their stock of human capital is through the individuals they hire (Parnes, 1984). Nevertheless, staffing practices in manufacturing firms traditionally have been simple and informal (Majchrzak, 1988). Such methods may be adequate for hiring unskilled or semiskilled employees, whose labor is essentially a substitutable commodity. Almost any applicant will do, and added expense for elaborate staffing practices would not have much utility (Cascio, 1991).

However, firms using integrated manufacturing, in which more advanced or specialized skills are required, will be likely to use more selective staffing practices to find the best and brightest workers (Kohler & Schultz-Wild, 1983). Since low-ability employees consume more time and effort than high-ability employees to be productive, human capital theory suggests that firms could easily justify efforts to distinguish ability levels, since they will recoup the initial investment through higher productivity and less training (England, 1972; Flamholtz & Lacey, 1981; Griliches & Mason, 1972). We would, for example, expect to see more active recruiting and consideration of applicants for each job in order to increase selection ratios (cf. Schneider & Schmitt, 1986). We would also expect the selection process to take longer, cost more money, and involve input from more people under integrated manufacturing than under traditional manufacturing. In general, the added efforts to increase selectivity imply that the payoff from hiring qualified applicants offsets the additional expense. These arguments lead to the following hypothesis regarding the effects of AMT, TQ, and JIT on staffing.

> *Hypothesis 1a: Facets of integrated manufacturing (AMT, TQ, JIT) are positively related to the selectivity of staffing.*

Comprehensive training. Training is a traditional focus of human capital theory (Schultz, 1960), which suggests that firms invest in skill development when they expect increased employee productivity to offset such training costs as paying an instructor, buying materials, and downtime. Like staffing, training efforts in manufacturing firms traditionally have been limited, informal, and unstructured (Majchrzak, 1988). In fact, on-the-job training (OJT), by far the predominant method, reflects an orientation toward immediate utilization of a general pool of labor (Wexley & Latham, 1981; Wiggenhorn, 1990). The espoused advantages of OJT—low cost, minimal training time, immediate productivity, concurrent trial period—may be most beneficial when only basic skills are required.

In contrast, integrated manufacturing requires employees with broader and more advanced skills (Dean & Snell, 1991; Wilkinson & Oliver, 1989), which implies a need for more formal and comprehensive training. Under integrated manufacturing, we would expect more frequent and extended training periods and more structured programs to ensure skill acquisition and transfer (cf. Baldwin & Ford, 1988). Training would also likely involve a greater number of employees than it would in traditional manufacturing firms, and include a broader range of skills. The costs of training would be justified by the long-range expected contribution of skilled employees to the productivity of a firm. These arguments lead to the following hypothesis:

> *Hypothesis 1b: Facets of integrated manufacturing (AMT, JIT, TQ) are positively related to the comprehensiveness of training.*

Developmental performance appraisal. Performance appraisal is typically seen as having two purposes: administration, comprising such actions as determining job assignments, raises, promotions, and terminations, and development, consisting of providing feedback, coaching, and identifying training needs (Latham & Wexley, 1981). Human capital theory suggests that a firm's investment in employee development depends on the potential economic impact of employees' performance, or their "marginal revenue product" (Mitchell, 1989).

When work is routinized, as in a traditional factory, the production system constrains behavior (Hofstede, 1978). Since only basic skills are used and output is largely determined by the system, differences in employee performance make little difference to the bottom line (Kaus, 1990). In these circumstances, almost any deviation from standard operating procedures is construed as negative. Performance appraisal is thus frequently carried out in a pro forma, nonparticipative manner and is intended simply as an administrative device to detect and correct errors (Ouchi, 1977, 1980; Snell; 1992). Not surprisingly, the time and expense associated with developmental aspects of appraisal are minimal (Latham & Wexley, 1981).

In contrast, performance appraisal takes on an important developmental role under integrated manufacturing. As noted above, firms using integrated manufacturing often require substantial discretion and flexibility from their employees. For example, continuous improvement—which implies that no level of performance is ever completely satisfactory—requires that employees discover creative ways to depart from established routines. Since employees have more discretion than in traditional plants, controlling their performance may be more difficult (Jones, 1984). However, since the economic impact of their performance is greater, control becomes even more important. As a consequence, we would expect managers to devote more time to providing feedback, discussing problems, and identifying areas for improvement. In turn, employees are likely to participate more in goal setting and to take a future-oriented approach to performance. This pattern suggests that the purpose of appraisal under integrated manufacturing is developing employees rather than simply auditing their performance.

> *Hypothesis 1c: Facets of integrated manufacturing (AMT, JIT, TQ) are positively related to developmental performance appraisal.*

Equitable rewards. Since firms invest in employees but do not actually own their human capital, they must devise methods for ensuring that individuals act in the firm's interest. Here is where human capital and control theories complement one another (Flamholtz & Lacey, 1981; Wallace & Fay, 1988). Reward systems are investments designed to induce individuals to join a firm and perform well over time.

Research in labor economics (e.g., Becker, 1964; Mitchell, 1989) and social psychology (Adams, 1963, 1965) has shown that employees' perceptions of equity affect their decisions to join, remain, and produce for a firm. If reward systems are inequitable, qualified individuals will be unlikely to join a firm, and the firm will have to make do with less qualified individuals. If rewards become inequitable once individuals are hired, they may be likely to leave. If they stay, they are likely to produce at a low level (Adams, 1963).

Equity is not a unidimensional concept (cf. Walster, Bersheid, & Walster, 1973); it includes such issues as external, internal, individual, and process equity (Wallace & Fay, 1988). In this study, we examined external and individual equity. *External equity* is defined as the degree to which a firm pays employees the price they would command in the external labor market. *Individual equity* is defined as the degree to which employees are rewarded proportionately to their individual performance (Wallace & Fay, 1988).[1]

Although observations about equity are not restricted to firms implementing integrated manufacturing, such firms may have a bigger incentive than traditional manufacturers to provide rewards commensurate with those of competitor firms. Since employees play a larger role under integrated manufacturing, human capital theory suggests that these firms have a greater need to hire qualified people in the first place, since hiring underqualified employees is more debilitating than it is in a traditional factory. If employees leave for competitor firms, the lost capital will be greater and more costly to replace. Thus,

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[1] The omission of internal and process equity limit the scope of this study (cf. Wallace & Fay, 1988).

> *Hypothesis 1d: Facets of integrated manufacturing (AMT, JIT, TQ) are positively related to externally equitable rewards.*

External equity is concerned with market wages; individual equity implies that "better workers should receive higher wages on the same job than poorer workers" (Wallace & Fay, 1988: 18). This wage discrepancy helps motivate employees to produce closer to their maximum potential (Cascio, 1991). In a traditional factory, where work is constrained, the effect of individual differences tends to be negligible (Kaus, 1990). Not surprisingly, the most common pay scheme is an hourly wage (Bureau of National Affairs, 1981). Time-contingent pay reflects the lack of discretion employees have in their jobs; they are mainly rewarded for attendance (Mahoney, 1989; Wiggenhorn, 1990). In contrast, in firms with integrated manufacturing, where skill levels are higher and performance can vary dramatically across employees, the economic impact of individual differences is larger. Such firms may be willing to pay proportionately higher wages to individuals to motivate superior workmanship. Along these lines, Kaus wrote that "[as] skills become more important and are rewarded financially, differences in performance between individuals with the same formal skills or training also become more important, and are rewarded financially. The more valuable the training, the greater the income inequality among those with the same training" (1990: 20).

Efforts to ensure individually equitable rewards assume that the benefits gained from retaining and motivating high-performing employees are greater than the cost savings obtainable from using a more egalitarian pay system and hiring more often from the labor market (Cascio, 1991; Mitchell, 1989). These arguments suggest the following:

> *Hypothesis 1e: Facets of integrated manufacturing (AMT, JIT, TQ) are positively related to individually equitable rewards.*

Interactive Effects of Integrated Manufacturing

One of the most salient features of integrated manufacturing is that AMT, TQ, and JIT jointly affect the nature of employee work. For example, working with JIT in a factory also using AMT is far more complex than it would be in a traditional factory because JIT must deal with AMT's shorter lead times and more complicated interdependencies (Gunn, 1987). Similarly, the combination of TQ and AMT requires more of employees since automated systems demand better-quality raw materials without the opportunity for operator fine-tuning (Hirschhorn, 1984). Downtime is extremely expensive for an automated plant, which places a substantial premium on preventive maintenance. Diagnosing quality problems becomes a greater challenge because of the inherent sophistication of automated systems. Finally, the combination of JIT and TQ is challenging because maintaining total quality in plants that switch rapidly between products (a characteristic of JIT) is difficult; processes have to be brought back into acceptable tolerances each time a change is made.

The possible combinations of integrated manufacturing practices require more from employees than the sum of the individual practices alone—thus making employees' contributions incrementally more valuable. A logical extension of this argument is that the simultaneous use of all three facets of integrated manufacturing places the highest demands on employees, making the value of human capital investments even greater than it is with a single combination. On the basis of these arguments, we hypothesized two-way and three-way interactions of AMT, JIT, and TQ affecting human resource management practices.

> *Hypothesis 2a: The interactive effects of integrated manufacturing practices (AMT, JIT, TQ) are positively related to the selectiveness of staffing.*
>
> *Hypothesis 2b: The interactive effects of integrated manufacturing practices (AMT, JIT, TQ) are positively related to comprehensiveness of training.*
>
> *Hypothesis 2c: The interactive effects of integrated manufacturing practices (AMT, JIT, TQ) are positively related to developmental use of performance appraisal.*
>
> *Hypothesis 2d: The interactive effects of integrated manufacturing practices (AMT, JIT, TQ) are positively related to externally equitable rewards.*
>
> *Hypothesis 2e: The interactive effects of integrated manufacturing practices (AMT, JIT, TQ) are positively related to individually equitable rewards.*

DATA AND METHODS

Data and Procedures

A potential pool of 512 manufacturing firms was drawn from several segments of the metal-working industry: primary metals (Standard Industrial Classification [SIC] 33), fabricated metal products (SIC 34), industrial and metal-working machinery (SIC 35), transportation equipment (SIC 36), and precision instruments (SIC 37). We chose these industry segments for their acknowledged adoption of advanced manufacturing systems (Majchrzak, 1986; Office of Technology Assessment, 1984). We identified plants in these industries using the *Harris Pennsylvania Industrial Directory*. Plants, rather than entire manufacturing firms, were the units of analysis because even plants in the same company may have very different manufacturing practices.

Plant managers. The initial contact people for this study were the plant managers. We mailed a cover letter and questionnaire measuring AMT, TQ, and JIT to each plant manager. After three weeks, we sent a prompting letter and a second questionnaire identical to the first to all plant managers who had not yet responded. A final total of 160 plant managers (31 percent) participated in the study. A comparison of the plants with respondent managers with a random sample of nonparticipating firms showed no significant differences for size and unionization (see the description of measures below).

Functional managers. Each plant manager was also asked to provide the names of a manager in each of three functions: operations, quality, and production control. An expert panel of 25 manufacturing managers had identified those three functions as the most likely to be affected by integrated manufacturing. By surveying across these three functions, we could examine the effects of integrated manufacturing for both direct labor (employees who actually produce finished goods) and indirect labor (employees who support the production process). Past research has focused almost exclusively on operations, which is surprising considering the importance of functions such as quality and production control to the success of integrated manufacturing (Dean & Snell, 1991).

Of the 160 participating plant managers, 123 provided the names of functional managers. Functional managers were asked about the facet of manufacturing pertinent to their areas of expertise: AMT for operations, TQ for quality, and JIT for production control. We used this information to corroborate the information provided by plant managers. In addition, we asked each functional manager about the following human resource management practices in his or her function: staffing, training, performance appraisal, rewards. After three weeks, we mailed a second letter and questionnaire to nonresponding managers. In total, 102 operations managers (82 percent), 109 quality managers (89 percent), and 97 production control managers (79 percent) participated.

Human resource managers. Each plant manager was also asked to provide the name of a human resource manager for the plant, and 123 complied. We asked the human resource managers about staffing and reward practices in each of the three functions to corroborate the responses of the functional managers. A total of 90 human resource management managers (73 percent) participated.

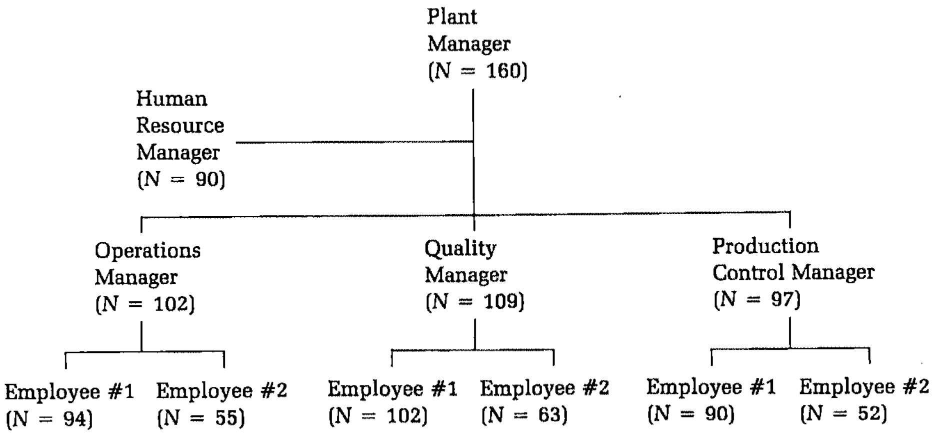
Nonmanagerial employees. Each functional manager was asked to distribute questionnaires to two hourly employees in his or her department. We asked these nonmanagerial employees about performance appraisal and training practices in their departments. This information was used to corroborate the information from their functional manager. After three weeks, we sent a second questionnaire, via the functional managers, to employees who had not yet responded. At least one operations employee returned the questionnaire in 94 plants, and both employees responded in 55 of those plants. We considered a case valid if either of the nonmanagers returned the questionnaire. Using this criterion, the number of valid cases for operations was 94. Similarly, the number of valid cases in quality was 102, and it was 90 in production control. (Both quality employees responded in 63 plants, and both production control employees in 52 plants.) Figure 1 depicts the data's characteristics.

Measures

The measures used in this study and the respondents to whom they were administered are briefly described below. We used at least two informants per plant for each scale. The Appendix gives specific items.

Integrated manufacturing. A concerted effort was made in this study to define and measure integrated manufacturing more comprehensively than have previous studies. Past researchers have examined specific techniques in isolation but have not addressed how the techniques form theoretical constructs. We pilot-tested the current measures on an independent group of manufacturing managers, using multiple items and multiple respondents to ensure both internal consistency and interrater reliability. *Advanced manufacturing technology* (*AMT*) was an 18-item scale measuring the extent to which a firm has implemented and integrated computer technologies for manufacturing (e.g., CAM, MRPII). This measure operationally defines the general domain of advanced manufacturing technologies, without regard to their prevalence across industries. Respondents were plant and operations managers. *Total quality* (*TQ*) was a 10-item scale measuring the extent to which a firm uses techniques to promote continuous improvement, doing things right the first time, and devotion to fulfilling customer needs. Respondents were plant and quality managers. *Just-in-time* (*JIT*) was a 10-item scale measuring the extent to which a firm attempts to cut costs through reduced

FIGURE 1
Distribution of Data Sources[a]



[a] A case was considered valid if one nonmanager responded. Final data set sizes were operations, N = 94; quality, N = 102; and production control, N = 90.

inventories and lead times and by controlling such features as the number of suppliers, size of deliveries, and total number of parts. Respondents were plant and production control managers. Since certain aspects of JIT, like preventive maintenance, are also associated with TQ (Gunn, 1987; Schonberger, 1986), it was initially difficult to distinguish between JIT and TQ.

Given that the literature suggests considerable overlap in the construct domains for AMT, JIT, and TQ, it was necessary to empirically confirm the dimensionality of the scales. We used principal components factor analysis with varimax rotation to assess convergence within each scale as well as divergence between scales. This analysis produced three stable factors representing AMT, TQ, and JIT, each of which had an eigenvalue above 1.0. Table 1 presents the factor structure.

A two-stage rule was used to categorize items to factors (cf. Nunnally, 1978). First, to make certain that a given item represented the construct underlying each factor, we used a weight of .30 as the minimum cutoff. Four items did not meet this criterion and were deleted from the final scales. Subsequently examining these items, we saw that their means were extremely low, indicating infrequent usage, and thereby restricting the ranges. Second, to avoid problems with cross-loadings, we required each item to clearly define only one factor. Operationally, if the difference between weights for any given item was less than .10 across factors, we deleted it from the final scale. One item (flexible manufacturing systems) did not meet this criterion, loading .33 on the AMT factor and .40 on the TQ factor, a difference of only .07; consequently, we deleted it from the final scale.

Three items initially considered aspects of JIT (minimizing set-up times, performing preventive maintenance, and making accounting system changes) loaded onto the TQ factor. Because these items represent the overlap of the two concepts suggested in the literature, we aggregated them with the other measures of TQ.

Human resource management practices. Five issues related to human capital investment through human resource management were measured in this study. *Selective staffing* was a 7-item scale measuring the extensiveness of a firm's selection process, as demonstrated, for instance, by the time and money spent and the number of people involved. Respondents were three functional managers and the human resource manager from each plant. *Comprehensive training* was an 8-item scale measuring the extensiveness of training and development opportunities, such as the frequency and variety of training, money spent, and the percentage of employees trained. Respondents were three functional managers from each plant and their nonmanagerial employees. *Developmental appraisal* was a 9-item scale measuring whether performance appraisal was used for developing employees, as exemplified by diagnosing training needs, frequent feedback, problem solving, and discussing future issues. Respondents were three functional managers from each plant and their nonmanagerial employees. *Equitable rewards* was an 8-item scale measuring the degree to which pay was competitive for the industry (external equity) and based on individual performance (individual

TABLE 1
Factor Analysis of Integrated Manufacturing Measures[a]

Questionnaire Items	1	2	3
Manufacturing resource planning (MRPII)	**.55**	.04	.14
Computer-aided design (CAD)	**.38**	.08	−.06
Numerical control (NC)	**.50**	−.02	−.33
Computer numerical control (CNC)	**.48**	.00	−.36
Direct numerical control (DNC)	**.47**	.00	−.02
Flexible manufacturing systems (FMS)	**.33**	.40	.09[b]
Robotics	**.13**	.29	−.08[b]
Automated materials handling	**.48**	.25	−.07
Computer-aided test and inspection	**.40**	.28	.06
Computer-aided process planning	**.58**	.20	.00
Product design–product planning	**.43**	.08	−.12
Product planning–component manufacturing	**.61**	.12	.14
Component manufacturing–assembly	**.55**	.02	.29
Assembly–production scheduling	**.56**	.05	.29
Production scheduling–maintenance	**.66**	.09	.01
Maintenance–materials handling	**.62**	.05	−.02
Materials handling–quality control	**.52**	.14	.22
Quality control–materials management	**.49**	.19	.31
Plant management devoted to quality improvement	.02	**.66**	−.01
Working with suppliers to improve quality	.09	**.67**	.09
Ability to measure cost of quality	.11	**.60**	.12
Current approach to providing quality products	.00	**.41**	.12
Manufacturing processes under statistical control	.13	**.57**	−.14
Employees have quality as a major responsibility	.23	**.45**	.03
Employees are given feedback about quality	.05	**.57**	−.06
Quality function deployment	.10	**.08**	.01[b]
Taguchi methods	.15	**.34**	.01
Continuous process improvements	.20	**.59**	.00
Attention devoted to minimizing set-up times	.11	**.40**	.05
Performance of preventative maintenance	.09	**.48**	.08
Accounting system reflects costs of manufacturing	.00	**.40**	−.24
Number of suppliers	.12	.13	**.49**
Size of deliveries	.03	.00	**.68**
Length of product runs	.00	−.11	**.60**
Number of total parts	−.05	−.15	**.67**
Amount of buffer stock	.06	.06	**.58**
Products pulled through the plant	−.11	.20	**.20**[b]
Plant laid out by process or product	−.07	.13	**.07**[b]
Eigenvalue	6.17	3.05	2.57
Percentage of variance explained	.16	.08	.07

[a] Boldface indicates which items are best explained by a given factor.

[b] This item was deleted from the final scale.

equity). Respondents were the three functional managers and the human resource manager.

These scales were also factor-analyzed (principal components with varimax rotation) and produced five factors corresponding to staffing, training, appraisal, externally equitable rewards, and individually equitable rewards. On the basis of this analysis (see Table 2), the measure for equitable rewards was broken out into two separate variables representing external and individual equity. As before, we used a two-stage rule to categorize items to factors. All of the human resource management items met the .30 factor-weight criterion. However, one item (fixed vs. flexible performance standards) did not meet the second criterion since it cross-loaded on the appraisal factor and the staffing factor. Consequently, we deleted the item from the final scale. Another item, "How closely are raises, promotions, etc.

TABLE 2
Factor Analysis of Human Resource Management Measures[a]

Questionnaire Items	1	2	3	4	5
Extensiveness of selection process	.03	.35	**.62**	.23	.29
Importance of selecting the best person	.02	.16	**.56**	.04	.07
How long it takes to select a person	−.14	.03	**.75**	.17	.00
Number of people involved in selection	.37	−.02	**.66**	.08	−.05
Amount of money spent on selecting people	.07	.07	**.75**	.28	−.08
Number of applicants screened for each job	.37	−.08	**.59**	−.17	−.07
Importance placed on staffing process	.34	.25	**.52**	.09	.15
Extensiveness of training process	**.47**	.36	.27	.01	.02
Priority placed on training employees	**.52**	.25	.24	−.06	.10
Formality and structure of training	**.62**	.11	.11	−.01	.34
Percentage of people receiving training	**.61**	.05	.10	.08	.18
Hours of formal training per year	**.70**	.29	.06	−.03	−.01
Different kinds of training programs	**.70**	.10	.03	.28	.12
Amount of money spent on training	**.81**	.18	.12	.08	.18
Training viewed as a cost or investment	**.48**	.33	.08	.04	−.01
Effort given to measuring performance	.06	**.63**	.18	.01	.23
Fixed vs. flexible performance standards	.04	**.28**	.31	−.16	.05[b]
Participative goal setting and appraisal	.27	**.59**	.13	.19	.02
Frequency of discussion about performance	.22	**.65**	.02	.06	.18
Focus on present vs. future performance	.25	**.44**	.01	.16	.01
Emphasis on personal development	.17	**.72**	.10	.10	−.02
Approach to discussing performance	.33	**.65**	.14	.08	.01
Number of people providing input to appraisal	.31	**.56**	−.06	.11	.06
Pay levels relative to other firms	.24	.04	.10	−.12	**.76**
Pay levels relative to past years	.09	.12	.01	.05	**.73**
Wages are competitive in the industry	.11	.09	.01	.08	**.79**
Pay people what other companies would pay	.13	.13	.03	.40	**.67**
Pay tied to performance	−.06	.29	.10	**.75**	.19
Wide range of pay across members in unit	.16	−.20	.05	**.74**	−.08
Pay reflects differences in contribution	.17	.13	.08	**.83**	.00
Pay based on comparison to others in unit	.13	.27	.16	**.72**	.11
Raises, promotions, and so forth, tied to performance	−.09	.37	.17	**.52**	.22
Eigenvalue	8.31	2.85	2.50	2.00	1.78
Percentage of variance explained	.26	.09	.08	.06	.05

[a] Boldface indicates which items are best explained by a given factor.

[b] This item was deleted from the final scale.

tied to performance appraisal?", loaded on individually equitable rewards and was aggregated with those items.

Organizational environment. Two variables assessing organizational environment were also measured. *Organization size* was a natural logarithmic transformation of the number of full-time employees, obtained from Standard & Poor's *Directory of Corporate Affiliations* (Kimberly, 1976). Since large organizations may be more likely than small ones to use integrated manufacturing and may have better-developed human resource management practices, we controlled for any extraneous effects of size. *Unionization* was a 1-item measure asking whether a union represented a firm's work force. Responses were coded 0 for "no" and 1 for "yes." Since unionization may be related to both the use of integrated manufacturing (Dean & Snell, 1991; Thomas, 1991) and the characteristics of human resource management practices (Evansohn, 1989), we also factored these data out of each equation.

Industry environment. Three industry dimensions were measured to control for their effects across firms (Dess, Ireland, & Hitt, 1990). Sources were the commerce department's *Survey of Manufactures* and Moody's *Industrials*. Following Keats and Hitt (1988), we assessed growth in each industry by regressing the natural logarithm of sales against time. The antilogarithm of the regression slope was used as an index of *munificence*. The antilogarithm of the standard error term from the same regression slopes was used to assess *dynamism*, or the degree of change in industry sales (Keats & Hitt, 1988). The MINL formula (Schmalensee, 1977) of sales concentration was used as a surrogate for the Herfindahl-Hirschman-index of *complexity*.

RESULTS

Table 3 shows the means, standard deviations, alphas, interrater reliabilities, and zero-order correlations for all variables. Recall that the data on integrated manufacturing (AMT, TQ, JIT) came from the manager of each plant and a designated functional manager. Given the substantial interrater reliability on these measures, we averaged data across the respondents to form aggregated variables (James, Demaree, & Wolf, 1984). Thus, AMT is based on the mean response of the plant and operations managers, TQ on the mean response of the plant and quality managers, and JIT on the mean response of the plant and production control managers.

Similarly, three of the human resource management measures (staffing, external equity, and internal equity) came from each of the functional managers and the human resources manager. The interrater reliability of these measures also showed substantial convergence within function, yet the zero-order correlations across functions for these measures were fairly low, indicating that the variable measuring human resource management practices should not be aggregated to the plant level. Consequently, for the operations

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TABLE 3
Summary Statistics

				Zero-order Correlations[a]							
Variables	Means	s.d.	Interrater Reliabilities	1	2	3	4	5	6	7	8
1. Munificence	1.08	0.06									
2. Dynamism	1.01	0.02		.86							
3. Complexity	7.40	9.98		−.21	−.15						
4. Unionization	0.71	0.35		.09	.08	−.25					
5. Size	5.76	1.06		.01	.01	.08	.05				
6. AMT	4.11	1.05	.96	−.11	−.15	.01	−.08	.49	(.86)		
7. JIT	4.29	0.76	.93	.01	−.01	−.05	.08	.04	.08	(.76)	
8. TQ	3.72	0.90	.83	−.08	−.06	.21	−.11	.18	.41	.01	(.76)
9. Staffing, operations	4.15	0.85	.83	.07	.05	.00	−.11	.15	.22	−.15	.09
10. Staffing, quality	4.20	0.80	.84	−.08	−.12	.01	−.04	.19	.22	−.11	.28
11. Staffing, production	4.12	0.77	.80	.02	−.03	−.06	.09	.20	.01	.10	.00
12. Training, operations	3.72	1.09	.71	.22	.17	.26	−.11	.30	.43	.05	.37
13. Training, quality	3.62	1.14	.68	.13	.10	.13	−.17	.21	.20	−.11	.40
14. Training, production	3.30	1.06	.72	.10	.08	.26	−.22	.01	.00	.04	.12
15. Appraisal, operations	3.74	0.77	.85	.22	.14	.07	−.12	.24	.30	−.06	.20
16. Appraisal, quality	3.74	0.80	.77	.02	−.05	.12	−.18	.05	.09	−.23	.26
17. Appraisal, production	3.72	0.74	.80	−.01	.05	.11	−.17	.01	.02	.04	−.15
18. External equity, operations	4.77	0.99	.74	−.17	−.18	.08	−.13	.27	.27	.03	.25
19. External equity, quality	4.62	1.05	.77	−.20	−.17	.08	−.20	.16	.17	.05	.30
20. External equity, production	4.61	1.05	.78	.02	.02	.06	−.12	.21	.17	.17	.02
21. Internal equity, operations	3.86	1.12	.81	.00	−.01	−.05	−.26	.17	.10	.11	.10
22. Internal equity, quality	3.73	1.35	.77	−.19	−.17	.05	−.23	.00	.13	.06	.10
23. Internal equity, production	4.14	1.14	.68	−.11	−.12	−.01	−.08	−.01	.17	.09	−.06

[a] Correlations above .15 are statistically significant at $p < .05$. Coefficient alphas are in parentheses.

function, we used the mean response of the human resources and operations managers to measure staffing, external equity, and internal equity. In quality, the mean of the human resources and quality managers' responses was used to measure these same variables. In production control, the mean response of

TABLE 3 (continued)

9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
(.81)														
.38	(.77)													
.18	.37	(.73)												
.34	.16	.08	(.84)											
.26	.45	.16	.38	(.87)										
.11	.21	.27	.25	.29	(.84)									
.33	.14	.08	.43	.23	.08	(.78)								
.24	.45	.07	.25	.45	.26	.10	(.85)							
.07	−.05	.23	−.02	−.06	.35	−.06	.11	(.80)						
.32	.18	.14	.21	.08	−.04	.16	.08	−.04	(.78)					
.11	.17	.17	.10	.37	.07	.05	.20	.14	.05	(.81)				
.20	.01	.26	.21	.01	.19	.16	.00	.28	.44	.43	(.79)			
.33	.15	.40	.15	.24	.06	.05	.18	−.01	.24	.25	.15	(.83)		
.06	.33	.15	.02	.35	.10	.03	.32	−.01	.06	.27	.12	.39	(.83)	
.30	.17	.28	.01	.05	.18	.05	.06	.18	.07	.12	.41	.18	.37	(.72)

the human resources and production control managers was used for the three variables.

This same procedure was applied to the two remaining human resource management variables (training and appraisal) that came from information provided by the functional managers and their subordinates. The interrater reliabilities showed convergence within functions, but the correlations indicated independence across functions. As a result, we based the measures of training and appraisal on the mean responses of the functional manager and nonmanagerial employee or employees within each department of each plant studied.

Hypothesis Testing

To test the hypotheses, hierarchical multiple regression was used to predict each human resource management variable with the set of integrated manufacturing variables (cf. Cohen & Cohen, 1975; Stone & Hollenbeck, 1989). In the first step, we entered the set of control variables (munificence, dynamism, complexity, size, and unionization) into the equation. In step 2, the set of integrated manufacturing variables (AMT, TQ, JIT) was entered. A significant incremental R^2 in this step could be interpreted as support for Hypotheses 1a–1e. In step 3, we entered the cross products of the three integrated manufacturing variables (AMT × JIT, AMT × TQ, JIT × TQ) to test for two-way interactions. Finally, in step 4, the three-way interaction of all the components of integrated manufacturing (AMT × TQ × JIT) was examined. Significant incremental R^2s in steps 3 or 4 could be interpreted as support for Hypotheses 2a–2e.

Selective staffing. Table 4 shows the effects of integrated manufacturing on staffing in operations, quality, and production control. After controlling for industry, size, and unionization, we found that AMT was positively related to staffing selectivity for employees in operations and quality, and TQ was positively related to staffing selectivity for employees in quality. JIT was negatively related to staffing selectivity in operations but positively related for employees in quality. Overall, these findings provide partial support for Hypothesis 1a, which predicts that the practices composing integrated manufacturing are positively related to the use of selective staffing practices. This effect is restricted to operations and quality employees. A notable exception to this trend is that JIT had a negative effect on staffing for operations employees.

In step 3, none of the two-way interaction terms had a significant incremental effect in any of the three functions. Similarly, none of the three-way interactions were significant either. Overall, these findings fail to support Hypothesis 2a, stating that the interaction of parts of integrated manufacturing positively affects selective staffing.

Comprehensive training. Table 5 shows the effects of integrated manufacturing on training comprehensiveness. AMT had a positive effect on training for employees in operations, and TQ had a positive effect on training for employees in operations and quality. JIT had no direct effect on training in any of the functions. With the exception of those for JIT, these findings provide some support for Hypothesis 1b, which predicts that facets of inte-

TABLE 4
Results of Hierarchical Regression Analysis for Selectiveness in Staffing[a]

	Operations				Quality				Production Control			
Variables	*b*	ΔR^2	R^2	*F*	*b*	ΔR^2	R^2	*F*	*b*	ΔR^2	R^2	*F*
Step 1		.05	.05	0.98		.02	.02	0.48		.02	.02	0.31
Constant	8.87				11.40*				3.52			
Munificence	2.56				1.02				0.09			
Dynamism	−7.51				−8.18				0.21			
Complexity	0.00				0.00				0.00			
Size	0.05				0.02				0.02			
Unionization	−0.30				−0.16				0.18			
Step 2		.14	.19	4.84*		.16	.18	6.01**		.01	.03	0.38
Constant	5.71				11.35*				2.52			
AMT	0.55**				0.25**				0.12			
TQ	−0.01				0.20**				0.04			
JIT	−0.23*				0.23**				−0.03			
Step 3		.03	.22	0.93		.00	.18	0.15		.03	.06	0.77
Constant	9.16				12.49*				−0.79			
AMT × TQ	0.11				−0.02				−0.16			
AMT × JIT	0.40†				0.12				−0.22			
TQ × JIT	0.02				0.01				−0.25			
Step 4		.00	.22	0.01		.00	.18	0.62		.00	.06	0.01
Constant	9.85				7.12				0.17			
AMT × QT × JIT	−0.02				0.14				−0.03			
Overall *F*				1.87*				1.77*				0.41

[a] Unstandardized betas are reported. *N*s for the functional areas are 94, 102, and 90, respectively.

† $p < .10$

* $p < .05$

** $p < .01$

grated manufacturing are positively related to the comprehensiveness of training. However, these effects appear to be restricted to employees in operations and quality.

In step 3, none of the two-way interactions reached conventional levels of significance. However, in step 4 the three-way interaction of AMT, TQ, and JIT was significant in production control. Counter to Hypothesis 2b, this effect was negative, which suggests that the simultaneous use of AMT, TQ, and JIT is associated with less-comprehensive training for these employees.

Developmental use of performance appraisal. Table 6 shows the effect of integrated manufacturing on developmental performance appraisal. AMT had a significant, positive effect on appraisal in operations, whereas TQ had a positive effect on appraisal for employees in quality. In contrast, JIT had a marginally negative effect on appraisal in operations and a significant, negative effect in quality. These findings provide mixed support for Hypothesis 1c.

In step 3, the interactions of AMT and TQ and of AMT and JIT were both negative in operations. Although accounting for a significant amount of incremental variance in the dependent variable, these findings are counter to Hypothesis 2c. In general, these interactions suggest that the positive effects of AMT are lessened when it is combined with the other facets of integrated manufacturing.

In step 4, the three-way interaction (AMT × TQ × JIT) was significant in production control, but in the direction opposite to the prediction of Hypothesis 2c. Apparently, the simultaneous use of AMT, TQ, and JIT is associated with less, not more, use of performance appraisal as a method of developing employees in production control.

Externally equitable reward systems. Table 7 shows the effect of integrated manufacturing on external equity. Both AMT and TQ were positive predictors of external equity in operations, and TQ was additionally related to external equity in the quality function. These findings provide partial support for Hypothesis 1d, but again the effects appear to be limited to AMT and TQ and restricted to employees in operations and quality. The lack of findings regarding JIT and employees in production control is similar to the other human resource management results.

In step 3, none of the two-way interactions reached conventional levels of significance. However, in step 4, the three-way interaction of AMT, TQ, and JIT was significant in operations and marginally so in production control. Although the interaction was positive in operations, suggesting that simultaneous use of AMT, TQ, and JIT leads to more externally equitable rewards for these employees, the opposite appears to be true in production control. The negative interaction term in this equation suggests less externally equitable rewards in association with integrated manufacturing. Thus, these findings provide mixed support for Hypothesis 2d.

Individually equitable reward systems. The results shown in Table 8 provide no evidence to support Hypothesis 1e, which predicts that facets of

TABLE 5
Results of Hierarchical Regression Analysis for Comprehensiveness of Training[a]

Variables	Operations				Quality				Production Control			
	b	ΔR^2	R^2	F	b	ΔR^2	R^2	F	b	ΔR^2	R^2	F
Step 1		.24	.24	5.58**		.16	.16	3.79**		.12	.12	2.33*
Constant	6.11				7.72				−4.38			
Munificence	7.56**				6.16*				1.05			
Dynamism	−11.44				−11.38				6.73			
Complexity	0.03**				0.02†				0.02*			
Size	0.13**				0.15**				0.00			
Unionization	−0.17				−0.61*				−0.58*			
Step 2		.14	.38	6.50**		.13	.29	5.31**		.01	.13	0.36
Constant	1.42				6.72				−5.66			
AMT	0.60**				0.22				0.11			
TQ	0.25**				0.39**				0.07			
JIT	−0.08				−0.17				0.08			
Step 3		.03	.41	1.29		.02	.31	0.90		.01	.14	0.27
Constant	1.95				6.13				−4.72			
AMT × TQ	−0.32†				0.14				0.05			
AMT × JIT	0.04				−0.27				−0.13			
TQ × JIT	0.15				0.12				0.11			
Step 4		.00	.41	0.60		.00	.31	0.01		.04	.18	3.46*
Constant	−0.19				4.99				18.24			
AMT × TQ × JIT	−0.20				0.03				−0.64*			
Overall F				4.78**				3.30**				1.38

[a] Unstandardized betas are reported. Ns for the functional areas are 94, 102, and 90, respectively.

† $p < .10$

* $p < .05$

** $p < .01$

TABLE 6
Results of Hierarchical Regression Analysis for Developmental Performance Appraisal[a]

	Operations				Quality				Production Control			
Variables	b	ΔR^2	R^2	F	b	ΔR^2	R^2	F	b	ΔR^2	R^2	F
Step 1		.09	.09	1.96†		.09	.09	1.90†		.06	.06	1.04
Constant	8.45				13.06				−6.84			
Munificence	5.26*				3.70†				−3.32			
Dynamism	−10.36				−13.31				14.36			
Complexity	0.01				0.01				0.00			
Size	0.03				0.06†				−0.03			
Unionization	−0.20				−0.46*				−0.33			
Step 2		.12	.21	3.91**		.10	.19	3.85**		.02	.08	0.65
Constant	5.63				11.38*				−7.01			
AMT	0.41**				−0.09				0.03			
TQ	0.08				0.20**				−0.13			
JIT	−0.16†				−0.26**				0.04			
Step 3		.07	.28	2.54*		.01	.21	0.52		.01	.09	0.28
Constant	2.07				13.38*				−8.13			
AMT × TQ	−0.41**				0.04				−0.11			
AMT × JIT	−0.48**				−0.21				−0.18			
TQ × JIT	0.15				0.06				0.05			
Step 4		.00	.28	0.03		.00	.21	0.01		.04	.13	3.31*
Constant	0.86				12.63				8.02			
AMT × TQ × JIT	0.03				0.02				−0.45*			
Overall F				2.54**				1.91*				0.92

[a] Unstandardized betas are reported. *N*s for the functional areas are 94, 102, and 90, respectively.

† $p < .10$

* $p < .05$

** $p < .01$

TABLE 7
Results of Hierarchical Regression Analysis for Externally Equitable Reward Systems[a]

	Operations				Quality				Production Control			
Variables	*b*	ΔR^2	R^2	*F*	*b*	ΔR^2	R^2	*F*	*b*	ΔR^2	R^2	*F*
Step 1		.16	.16	3.42**		.11	.11	2.54*		.07	.07	1.33
Constant	8.53				10.66				−7.11			
Munificence	−2.57				−0.79				−2.47			
Dynamism	−1.69				−5.59				13.79			
Complexity	0.00				0.01				0.01			
Size	0.14**				0.11**				0.08			
Unionization	−0.38				−0.50*				−0.39			
Step 2		.09	.25	3.48**		.05	.16	1.70		.02	.09	0.72
Constant	5.43				9.52				−9.51			
AMT	0.34*				0.07				0.24			
TQ	0.23*				0.25*				0.00			
JIT	−0.06				0.00				0.10			
Step 3		.03	.28	1.00		.01	.17	0.21		.02	.11	0.64
Constant	7.16				10.66				−6.66			
AMT × TQ	0.13				−0.08				−0.24			
AMT × JIT	0.41†				−0.03				0.14			
TQ × JIT	−0.19				0.11				0.19			
Step 4		.03	.31	3.57*		.00	.17	0.15		.04	.15	2.34†
Constant	9.61				6.78				−25.45†			
AMT × TQ × JIT	0.46*				0.10				−0.53†			
Overall F				2.95**				1.52†				1.09

[a] Unstandardized betas are reported. *N*s for the functional areas are 94, 102, and 90, respectively.

† $p < .10$

* $p < .05$

** $p < .01$

integrated manufacturing are related to the internal equity of rewards. In step 4, the three-way interaction was significant, but negative, in production control—a finding consistent with others in the study, but counter to Hypothesis 2e. This result suggests that simultaneous use of AMT, TQ, and JIT is associated with less individually equitable rewards for employees in production control.

DISCUSSION

Overview and Implications of the Findings

Many recent articles have advocated increased investment in human capital (Commission on the Skills of the American Workforce, 1990; Hitt, Hoskisson, & Harrison, 1991; Perry, 1991). Our data show that firms using integrated manufacturing exert more effort in developing their operations and quality employees through human resource management practices than do firms engaged in traditional manufacturing. More specifically, results from the plants we examined indicate that AMT is positively related to selective staffing, comprehensive training, developmental appraisal, and externally equitable rewards for operations employees and is also positively related to selective staffing for employees in quality. Similarly, TQ is positively related to those same human resource management practices for quality employees, and it is also related to the comprehensiveness of training for employees in operations.

These findings suggest that managers may not treat human and technical systems as separate entities, but instead may manage them in concert. It is impossible to assert unequivocally that this is true without controlling for timing and order of changes, but the findings at least partially address the concerns of critics who have argued that human resource management practices are unduly isolated from the realm of manufacturing. These findings also may be encouraging to those who have argued that integrated manufacturing will be more successful when accompanied by employee upskilling (e.g., Walton & Susman, 1987), or to those concerned about the general deskilling of our work force (e.g., Braverman, 1974; Bright, 1958). Although some managers may still view integrated manufacturing as a means for deskilling and "decoupling" labor, the trend across firms seems to be just the opposite—integrated manufacturing represents an opportunity for increased employee contribution, which can be nurtured through human resource management investments in human capital.

The results for JIT were less uniform than those for either AMT or TQ. Although JIT is positively related to selective staffing in quality, it is negatively related to selective staffing in operations. In addition, JIT is negatively related to performance appraisal in both quality and operations. It may be that JIT has a limiting effect on individual discretion (Klein, 1991), in contrast to the other two facets of integrated manufacturing. In fact, Klein noted

TABLE 8
Results of Hierarchical Regression Analysis for Individually Equitable Reward Systems[a]

	Operations				Quality				Production Control			
Variables	*b*	ΔR^2	R^2	*F*	*b*	ΔR^2	R^2	*F*	*b*	ΔR^2	R^2	*F*
Step 1		.12	.12	2.44*		.10	.10	2.14*		.03	.03	0.51
Constant	−3.43				11.52				11.95			
Munificence	−2.32				−0.95				−0.45			
Dynamism	9.46				−6.07				−6.87			
Complexity	−0.01				0.00				0.00			
Size	0.11*				0.03				−0.03			
Unionization	−0.82**				−0.98**				−0.25			
Step 2		.01	.13	0.32		.01	.11	0.33		.04	.07	1.14
Constant	−3.51				10.49				8.48			
AMT	−0.04				0.23				0.37			
TQ	0.07				0.02				−0.08			
JIT	0.13				0.03				0.12			
Step 3		.00	.13	0.02		.05	.16	1.60		.03	.10	0.98
Constant	−3.91				7.50				14.73			
AMT × TQ	0.02				−0.03				−0.04			
AMT × JIT	−0.05				−0.69*				0.15			
TQ × JIT	−0.01				0.26				0.34			
Step 4		.00	.13	0.02		.00	.16	0.01		.04	.14	3.82*
Constant	−5.85				8.93				39.28*			
AMT × TQ × JIT	0.05				−0.03				−0.69*			
Overall *F*				1.03				1.36				1.03

[a] Unstandardized betas are reported. *N*s for the functional areas are 94, 102, and 90, respectively.

† $p < .10$

* $p < .05$

** $p < .01$

"In [its] pure form, JIT . . . can turn workers into extensions of a system no less demanding than a busy assembly line" (1989: 61). If JIT limits employee discretion, then performance appraisal would mainly serve as an administration device for detecting and correcting errors, rather than as a developmental tool.

One perplexing finding from this study pertains to the notion that the parts of integrated manufacturing work synergistically. Although there were several significant interaction effects found in this study, these were universally in a direction opposite from our hypotheses' predictions. For example, the interactions of AMT and TQ and of AMT and JIT had negative effects on performance appraisal in operations—even though the main effect of AMT was positive. At first this pattern seemed implausible; one likely explanation is that as integrated manufacturing blurs the lines of delineation between functions, it may simultaneously make performance appraisal more difficult. Previous research has suggested that control becomes problematic when firms move toward a paradigm of collective output, as it is difficult to ascertain individual contributions to performance (Jones, 1984; Snell, 1992). If the interactions of AMT and TQ or of AMT and JIT result in inherently more interdependence, our findings may indicate difficulty in conducting performance appraisal rather than its lack of importance for building human capital.

Even more surprising than the findings for the two-way interactions was the finding that the three-way interaction of AMT, TQ, and JIT showed a consistently negative effect on human resource management practices for employees in production control. These particular findings may be consistent with what Hirschorn called "defunctionalization" (1984: 70). In contrast to scientific management, in which workers become tied more and more to a machine, defunctionalization means that workers are fundamentally displaced from production. At the extreme, Hirschorn warned that integrated manufacturing may deskill certain employees de facto: "Postindustrial technology threatens to throw [workers] out of production, making them into dial watchers without function or purpose . . . . Historically, we would then see the worker moving from being the controlled element in the production process to operating the controls to controlling the controls" (1984: 70).

As operations employees become less responsible for the direct execution of work, they may acquire responsibility for indirect labor tasks such as scheduling, maintenance, trouble shooting (Argote & Goodman, 1986), debugging (Manufacturing Studies Board, 1986), and process improvements (Majchrzak & Paris, 1986). In short, employees in production control may become superfluous, their skills and responsibilities subsumed under the operations function. Results from this study suggest that although integrated manufacturing is associated with human capital investments in operations and quality, the opposite is true in production control. No one facet of integrated manufacturing has a negative effect on production control, nor do any two facets in combination. But when all three facets of integrated manufacturing are introduced simultaneously, production control employees receive proportionately less training, less developmental appraisal, and less individually equitable wages than they do under traditional manufacturing, each reduction suggesting lower investment in human capital. These findings are not strong in terms of the variance explained, but their consistent occurrence is certainly noteworthy.

The lack of interaction effects in other areas suggests that although individual aspects of integrated manufacturing bear a relationship to human capital investments, their joint usage typically does not. This pattern may indicate that managers either do not recognize or choose to ignore potential synergies among facets of integrated manufacturing as they pertain to human resource management.

Limitations and Directions for Research

There are limitations to this study that, combined with the findings, raise several issues for future investigation. First, this study only examined the relationships between integrated manufacturing and human resource management practices; it did not provide any indication about the decision-making processes that precede human capital investments. Several authors (e.g., Rose & Jones, 1985; Majchrzak, 1988) have noted that managers may not consider human resource management issues when planning for new technology, and even when they do, other issues will likely complicate the decision process. Exogenous factors, such as size, control, performance (Dean & Snell, 1991) and labor relations (Kelly, 1990) may moderate the adaptation process.

Second, although this study focused on cross-sectional relationships, future research might be directed at uncovering the dynamic elements of change. In fact, it is not obvious from our findings that human resource management has been adapted at all. It is also possible that firms already investing heavily in human capital are more likely to adopt advanced manufacturing practices, perhaps seeing an opportunity to use more fully the human capital they have built up. This raises the possibility that human resource management can act as a leading, as well as a lagging, aspect of technological change (Lawler, 1981).

Third, future research should investigate more detailed aspects of human resource management used in conjunction with AMT, TQ, and JIT. Given the results of the present study, if implementation problems are largely human resource issues (Adler, 1988), they must be subtler than a simple failure to recognize the manufacturing–human resource management connection, or the tendency to deskill employees. The present study explored broad issues related to human resource management; however, we still know little about the particular skills and behaviors that are selected, trained, appraised, and rewarded. For example, selective staffing does not guarantee the right criteria are used, and increased training does not guarantee the content of training is appropriate. Researchers have argued that cognitive and interpersonal skills are more important in an advanced manufacturing environment (Ettlie, 1988; Majchrzak, 1988). But are these skills replacing or augmenting the technical and manual skills currently used? Similarly, human capital theorists have posited that since employees can transfer very general skills to other jobs with other firms, firms will be more likely to invest in training when the skills acquired are specialized and, therefore, firm-specific (Becker, 1976). Resolution of these issues would help clarify the role of human resource management in human capital investments.

Fourth, since this study found effects for both direct and indirect labor, it appears that integrated manufacturing transcends functional boundaries. Future research should continue to examine a broad array of jobs in manufacturing. As noted at the outset, previous studies have limited their scope of investigation to employees in operations, a practice that seems myopic when one considers that the proportion of direct to indirect labor in U.S. manufacturing firms continues to decline (Hayes et al., 1988).

Fifth, the human capital notion itself is only one theoretical perspective on the relationship between advanced manufacturing and human resource management. Future research should explore additional theoretical perspectives as well. For example, perhaps institutional forces (Scott, 1988) shape firm human resource management practices in a manner unrelated to boundedly rational calculations of the benefits of human capital investment. Or, as we found in previous work (Dean & Snell, 1991), sources of organizational inertia may influence the link between integrated manufacturing and other organizational arrangements.

Finally, the present study provided a descriptive view of the manufacturing–human resource management relationship. However, although managers seem to be taking action to align human resource management and manufacturing, perhaps they are not yet taking enough action to bring about performance improvements—or perhaps they are taking the wrong actions. For example, researchers still do not know whether increased investment in human capital or different approaches (e.g., scientific management, defunctionalization) might lead to higher performance. As Majchrzak noted, many firms still view production gains as "most likely when the technology is designed to minimize the need for skills and to diminish worker decision making" (1988: 57). In the short run, as with any capital outlay, increased investment in human capital is likely to be costly, and minimizing investment in human resource management may actually cause a temporary increase in profits. However, in the long run, if the contributory potential of employees is debilitated, firms may lose the productive potential and adaptive capability of integrated manufacturing. To resolve these issues, future research should examine the performance impact of integrated manufacturing and human resource management over time.

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APPENDIX
Questionnaire Measurement Scales

Advanced Manufacturing Technology

"To what extent are each of the following technologies used in your plant? (1 = not at all, 3 = moderately, 5 = extensively)

1. Manufacturing resource planning (MRP II)
2. Computer-aided design (CAD)
3. Numerical control (NC)
4. Computer numerical control (CNC)
5. Direct numerical control (DNC)
6. Flexible manufacturing systems (FMS)
7. Robotics
8. Automated materials handling
9. Computer-aided test and inspection
10. Computer-aided process planning

"To what extent are transactions between the following production processes accomplished using computers? (1 = not computer integrated at all, 3 = moderately computer integrated, 5 = completely computer integrated, N = not applicable/function does not exist in our plant)

11. Product design-development and production planning
12. Production planning and component manufacturing
13. Component manufacturing and assembly
14. Assembly and production scheduling
15. Production scheduling and maintenance
16. Maintenance and materials handling
17. Materials handling and quality control
18. Quality control and materials management

Total Quality

1. "How much time does the plant management staff devote to quality improvement? (1 = very little, 4 = a moderate amount, 7 = a great deal)
2. "How much time is spent working with suppliers to improve their quality? (1 = very little, 4 = a moderate amount, 7 = a great deal)
3. "How well are you able to measure the 'cost of quality' in your plant? (1 = not at all, 4 = to some extent, 7 = precisely)
4. "How would you describe your current approach to providing quality products? (1 = building it in, 4 = some of each, 7 = inspecting it in)
5. "What percentage of the plant's manufacturing processes are under statistical control?
6. "What percentage of the plant's employees have quality as a major responsibility?
7. "What percentage of the plant's employees are routinely given feedback about quality?

"How would you describe the level of use within your plant of the following quality improvement methodologies? (1 = little or none, 4 = a moderate use, 7 = consistent use)

8. Quality function deployment
9. Taguchi methods
10. Continuous process improvements

Just-in-Time

"How much has each of the following changed in the past five years? (all items were reverse-coded; 1 = huge decrease, 4 = same, 7 = huge increase)

1. Number of your suppliers
2. Size of their deliveries
3. Length of product runs
4. Number of total parts
5. Amount of buffer stock

Selective Staffing

1. "How extensive is the employee selection process for a job in this unit? (e.g., use of tests, interviews, etc.) (1 = not extensive, 4 = moderate, 7 = very extensive)
2. "How important is it to select the best person for a given job? (1 = not important, 4 = important, 7 = very important)
3. "In general, how long does it take to select someone for a position in this unit once the job becomes open? (1 = short time, 7 = long time)
4. "How many people are involved in the selection decision? (1 = 1 person, 7 = 7 or more)
5. "How much money is generally spent in selecting people for a job? (1 = very little, 4 = moderate amount, 7 = great deal)

6. "How many applicants are screened for each person hired for a job? (1 = 1, 7 = 20 or more)
7. "How much importance is placed on the staffing process in this unit? (1 = very little, 4 = moderate amount, 7 = great deal)

Comprehensive Training

1. "How extensive is the training process for members of your work unit? (1 = not extensive, 7 = very extensive)
2. "How much priority is placed on training employees in your unit? (1 = very little, 4 = moderate amount, 7 = great deal)
3. "How formal or structured is the training process? (1 = very unstructured, 7 = very structured)
4. "What percentage of people have received training this past year? (1 = 0%, 7 = 100%)
5. "On average, how many hours of formal training does a typical member of your work unit receive per year? (1 = 0, 7 = >60 hours)
6. "How many different kinds of training programs are available for members of your work unit to attend? (1 = very few, 7 = wide variety)
7. "How much money is spent on training individuals in your work unit? (1 = almost none, 7 = great deal)
8. "Do you feel training is viewed as a cost or as an investment? (1 = viewed as a cost, 7 = viewed as an investment)

Developmental Performance Appraisal

1. "How much effort is given to measuring employee performance? (1 = very little, 4 = moderate amount, 7 = great deal)
2. "How would you describe the performance standards in your unit? (1 = fixed, 7 = flexible)
3. "How much do employees participate in goal setting and appraisal? (1 = very little, 4 = moderate amount, 7 = great deal)
4. "How often is performance discussed with employees? (1 = rarely, 4 = occasionally, 7 = daily)
5. "Do discussions focus on present performance or future performance? (1 = present, 7 = future)
6. "When performance is discussed, how much emphasis is placed on finding avenues of personal development for an employee? (1 = very little, 4 = moderate amount, 7 = great deal)
7. "How closely are raises, promotions, etc., tied to performance appraisal? (1 = not closely, 4 = moderately, 7 = very closely)
8. "How would you describe the approach used to discuss performance? (1 = tell/sell, 4 = tell/listen, 7 = problem solving)
9. "How many people provide input to the performance evaluation of each employee? (1 = 1, 7 = 7 or more)

Equitable Reward Systems

1. "How would you rate pay levels in this unit relative to other firms? (1 = low, 4 = same, 7 = high)
2. "How would you rate the pay levels in this unit relative to past years? (1 = lower than past, 4 = same, 7 = higher than past)
3. "The wages in this work unit are not very competitive for this industry. (1 = completely true, 7 = completely false)
4. "How much emphasis is placed on paying people in this work unit what they would be paid on similar jobs in other companies? (1 = very little, 4 = moderate amount, 7 = great deal)

5. "How closely is pay tied to individual performance? (1 = not closely, 4 = somewhat, 7 = very closely)
6. "How wide is the range in pay across members in this work unit? (1 = narrow, 4 = moderate, 7 = very wide)
7. "To what extent do differences in pay across members of this work unit represent differences in their contribution? (1 = very little, 4 = moderate amount, 7 = great deal)
8. "To what extent are people paid what they are worth compared to others in the work unit? (1 = very little, 4 = moderately, 7 = great deal)"

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POWER IN TOP MANAGEMENT TEAMS: DIMENSIONS, MEASUREMENT, AND VALIDATION

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Top managers' power plays a key role in strategic decision making. However, although numerous scholars have recognized its importance, very few have attempted to measure the phenomenon. In this article, I present a set of dimensions measuring top managers' power and suggest a measurement methodology to facilitate empirical inquiry. Data from a group of 1,763 top managers in three industries were used to assess the validity and reliability of the power dimensions in three studies. Results demonstrate strong support for the proposed power dimensions.

The topic of executive leadership has recently received significant attention from scholars in strategy and organization theory. They have concentrated on such issues as the composition of top management teams, executive succession, managerial styles, board-management relations, and fitting executive teams to environments and strategies. However, one important area that has received little attention (Eisenhardt and Bourgeois [1988] is an exception) is top managers' power. This lack is surprising, given the importance of power relationships to strategic choice.

Power is equally central to research on top management teams. In fact, the choice of unit of analysis in research on top managers and the issue of managerial power are two sides of the same coin. That is, adoption of a unit of analysis rests on an implicit assumption about the distribution of power among top managers. For example, in an organization in which the chief executive officer (CEO) wields dominant power, studying only the CEO may provide sufficient information with which to test propositions. However, in organizations in which power is less polarized, consideration of a coalition of top managers is necessary to fully capture the range of managerial orientations prevailing. Hence, consideration of the distribution of power among top managers seems an essential ingredient for research on top management teams.

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In this article, I focus on the most senior of top managers, the "dominant coalitions" of firms (Cyert & March, 1963). Although most large firms have many officers, typically only a small subset of managers is most responsible for setting policy (Thompson, 1967). It is this inner circle, or dominant coalition, that was the focus of this research.

The dominant coalition of a firm typically consists of the CEO and several of his or her most senior managers. However, although the CEO is usually the most powerful member of this group, such is not always the case (Mintzberg, 1983). For example, managers with large shareholdings may be more powerful than a CEO. Except in the most extreme cases, management is a shared effort in which a dominant coalition collectively shapes organizational outcomes. The limited empirical research comparing explained variance using CEOs or a wider group of top managers has consistently found that the latter unit of analysis yielded superior results (Bantel & Jackson, 1989; Finkelstein, 1988; Hage & Dewar, 1973; Tushman, Virany, & Romanelli, 1985). These findings support the notion that CEOs share power with other senior executives in many firms. Hence, to more fully understand how top managers influence organizational direction, it is important to differentiate managers in terms of their power.

The research reported here had three primary purposes: (1) to argue that managerial power is a central element in strategic choice, (2) to conceptualize major power sources in dominant coalitions, and (3) to suggest and validate specific measures of power that are readily available to other researchers. The following section examines power and strategy, illustrating how they interact and hence, why studying managerial power is so important for researchers in strategic management. Next, I present both a set of top managerial power dimensions and a measurement methodology to aid researchers, and finally, report three studies that test the validity of these dimensions.

POWER IN STRATEGIC CHOICE

Power is defined here as the capacity of individual actors to exert their will. This definition is consistent with those of other scholars (Hickson, Lee, Schneck, & Pennings, 1971; MacMillan, 1978; Pfeffer, 1981) and readily lends itself to an analysis of power among top managers in organizations. Although power may be exercised in numerous settings (Pfeffer, 1981), this article concentrates on its role in strategy making.

Child (1972) recognized that power is central to strategic choice. He recommended that investigators study power to understand what strategic choices are made. By so doing, they can make confident predictions about the impact of managerial orientations on strategy. As Child argued, only when power can be adequately measured is high predictive certainty likely to be achieved.

There is considerable support for this view from other scholars. Strategic decisions are unstructured and replete with ambiguities (Mintzberg, Raisinghani, & Theoret, 1976). Hence, they invite the use of power (Mintzberg, 1983), with different executives favoring their preferred choices. In a similar vein, Tushman (1977) argued that the less "programmable," or easily specified, a decision, the more nonbureaucratic influences are important. Such a situation is most likely to arise at the upper echelons of an organization (Tushman, 1977), where uncertainty is greatest (Thompson, 1967); strategic decisions are exemplary nonprogrammable decisions. Hence, power can be seen to hold a central position in strategy making.

In support of the theoretical arguments discussed above, a number of empirical studies of strategic decision making have identified power as a central concept. Carter (1971) emphasized the importance of bargaining in the computer equipment company he studied. Pettigrew (1973), in analyzing one firm's choice of a computer system, described how power helped resolve conflicting preferences for competing manufacturers.

Other scholars have emphasized the role of power in strategic decision making in their work. For example, Murray looked at strategic decision making in a regulated utility, describing choice as a "negotiated outcome" (1978: 960). He argued that strategic change would proceed incrementally when power was dispersed among several actors. In another study, Miles and Cameron (1982) discussed the role of organizational power in strategic adaptation. In a sample of six tobacco firms, they found that the power of different functional groups influenced diversification strategy. These studies are supported by a number of others emphasizing the role of power in top managerial decision making (Allison, 1971; Bower & Doz, 1979; Eisenhardt & Bourgeois, 1988; Hinings, Hickson, Pennings, & Schneck, 1974).

This brief review of the literature underlines the relevance of power in strategic decision making. Because of its significance to top managerial actions, explicit consideration of the role of power when studying top management teams seems critical. The following section outlines four key dimensions of top managerial power.

DIMENSIONS OF TOP MANAGERS' POWER

There have been many attempts to outline measures of power (e.g., Emerson, 1962; French & Raven, 1959; Shukla, 1977). Although understanding of the phenomenon has advanced, previous frameworks were not specifically developed with top managers in mind, reducing their usefulness for the present. Additionally, a common shortcoming was a lack of concern for measurement. It becomes difficult to assess the relative merits of a set of power dimensions when there is little indication of its measurement potential.

The approach taken here attempted to overcome these problems by (1) narrowing the focus to power within the dominant coalition of a firm alone, (2) recognizing the multidimensional nature of power (March, 1966) by defining four power dimensions relevant to top managers, and (3) developing a set of objective indicators of power to facilitate empirical measurement.

Power relations in dominant coalitions arise because of the interdependent nature of managerial work (Hickson et al., 1971; Thompson, 1967). Power accrues to top managers who (1) can cope with uncertainty (Thompson, 1967) and (2) are uniquely positioned to do so (Crozier, 1964). Hence, as Emerson (1962) argued, power is a relative concept that can only be understood in a particular context. In this research, the context was dominant coalitions, and the important sources of uncertainty were those elements of organizations and their environments that most directly affect managerial work.

Given the centrality of managing uncertainty, it follows that the key bases of power for top managers are the ability to cope with internal and external sources of uncertainty. Adopting a stakeholder approach (Freeman, 1984) allows identification of major sources of uncertainty. Key internal sources of uncertainty are other top managers and boards of directors, and major external sources of uncertainty are a firm's task and institutional environments. The corresponding types of power that accrue to executives who can manage these uncertainties are structural power, ownership power, expert power, and prestige power. Identifying multiple dimensions of power is consistent with the nature of this complex construct (March, 1966) and addresses a broader range of sources of uncertainty than has been discussed in the literature.

Although much has been written on external sources of uncertainty and their effects on managerial power (e.g., Pfeffer & Salancik, 1978; Thompson, 1967), internal sources of uncertainty have received considerably less attention. However, from a top-management-team perspective, it is not hard to see how managers create uncertainty by holding conflicting preferences that can confuse strategic direction. Managers who can reduce this uncertainty by controlling an organization's decision agenda (Kotter, 1982), the alternatives considered (Tushman & Romanelli, 1985), or information flows (Gray & Ariss, 1985) will gain power.

Boards of directors, as representatives of a firm's shareholders, also can create uncertainty for top management teams. Although most boards have relatively little influence, those with significant outside shareholders have the power to limit managerial discretion (Hambrick & Finkelstein, 1987). In fact, there is evidence that firms with large outside shareholders may follow different strategies than do firms without such shareholders (Baysinger, Kosnik, & Turk, 1991). Managers who can control board activities and reduce the uncertainty that arises when boards have the power to influence strategy can gain power within a firm's dominant coalition.

The power dimensions applied in this research were defined as follows:

Structural Power

This is perhaps the most commonly cited type of power; it is based on formal organizational structure and hierarchical authority (Brass, 1984; Hambrick, 1981; Perrow, 1970; Tushman & Romanelli, 1983). Managers who have a legislative right to exert influence are influential. Hence, CEOs have high structural power over other members of dominant coalitions because of their formal organizational position. This authority allows CEOs to manage uncertainty by controlling (to a degree) the behavior of their subordinates. More generally, although CEOs typically have the most structural power because of their preeminent formal organizational position, this dimension varies among other top managers. For example, structural power can take the form of "pulling rank" during disputes on strategic direction within a top team. Alternatively, this influence can be more indirect, such as when senior managers are privy to more information reaching successively higher levels or have greater control of resources than junior managers. The greater a manager's structural power, the greater his or her control over colleagues' actions.

Ownership Power

Power accrues to managers in their capacity as agents acting on behalf of shareholders. Hence, the strength of a manager's position in the agent-principal relationship determines ownership power. Where managers fall along this continuum depends on their ownership position as well as on their links to the founder of a firm. For example, all other things being equal, a top manager with significant shareholdings in an organization will be more powerful than a manager without such a base of control (Zald, 1969). In addition, managers who are founders of a firm or related to founders may gain power through their often long-term interaction with the board, as they translate their unique positions to implicit control over board members. Hence, managers with ownership power will gain some measure of control over boards of directors. And since most managers tend to be risk-averse, managers who can reduce the uncertainty emanating from a firm's board of directors will be more powerful than others.

Expert Power

The ability of top managers to deal with environmental contingencies and contribute to organizational success is an important source of power (Crozier, 1964; Hambrick, 1981; Hickson et al., 1971; Tushman & Romanelli, 1983; Mintzberg, 1983). Several components of its task environment can create uncertainty for an organization, such as its customers, suppliers, competitors, and the government (Porter, 1980; Thompson, 1967). The more managers have developed contacts and relationships with elements of the task environment, the greater is their ability to cope with contingencies of the task environment, and the greater is their expert power.

Managers with relevant expertise may have significant influence on a particular strategic choice (Yetton & Bottger, 1982) and are often sought out for their advice (Tushman & Scanlan, 1981). However, power tends to accrue best when a manager's expertise is in an area critical to an organization (Hickson et al., 1971). Criticality in turn depends on what elements of the task environment the organization finds most problematic (Kanter, 1977). In addition, the breadth of managers' experience enhances their ability to control these critical contingencies.

Prestige Power

An important source of power is personal prestige or status. Managers' reputation in the institutional environment and among stakeholders influences others' perceptions of their influence (Dalton, Barnes, & Zaleznik, 1968). Institutional environments are comprised of those members of society, such as governments, financial institutions, and other important actors external to a firm, that individual organizations must look to for support and legitimacy (Scott & Meyer, 1983). In addition, managers' standing in the "managerial elite" sends out powerful messages to other top managers about their personal importance (Useem, 1979). The managerial elite consists of those "individuals who occupy formally defined positions of authority at the head of a social organization or institution" (Giddens, 1972: 348). Managerial prestige promotes power by facilitating the absorption of uncertainty from the institutional environment both informationally and symbolically. Members of the managerial elite tend to be active in institutional governance (Useem, 1979). They may thus gain power from external contacts, which may provide information of value to an organization, in much the same way as the external communication "stars" (Tushman & Romanelli, 1983) and "boundary spanners" (Aldrich & Herker, 1977) of firms gain power from contact with individuals outside their organizations. As Galbraith (1973) argued, information acquisition is an important way to reduce uncertainty. For example, senior managers who serve on external boards may receive timely information on business conditions that they would not otherwise have been privy to.

Prestige also provides power through suggesting that a manager has gilt-edged qualifications and powerful friends. A firm's legitimacy depends in part on the prestige of its managers (D'Aveni, 1990); to the extent that an organization's enhanced legitimacy reduces uncertainty from the institutional environment (Selznick, 1957), prestige is an important source of power.

Together, these four dimensions define top managers' power. It is important to note, however, that other power dimensions may be relevant as well. For example, power may emanate from a manager's personality. In other cases, a manager with a "hot hand" may gain power. I considered the four dimensions outlined here to be the most important organizational sources of top managerial power. To the extent that they do not represent social-psychological sources of power and the occasional fluidity of power, their generalizability is limited.

The following section discusses methods of measuring power and outlines an approach that emphasizes objective indicators.

THE MEASUREMENT OF TOP MANAGERS' POWER

The measurement of power has been a major stumbling block in investigations of the phenomenon in the literature (March, 1966; Pfeffer, 1981). One of the major problems has been an overreliance on perceptual indicators of power and a lack of objectivity in the resulting measures. Power is a sensitive subject for many managers; the word itself is heavily laden with meaning. Perceptual measures assume that "social actors are knowledgeable about power within their organizations; informants are willing to divulge what they know about power distributions; and such a questioning process will not itself create the phenomenon under study, power" (Pfeffer, 1981: 55). In spite of these drawbacks, perceptual measures of power are important for what they tell us about shared judgments among social actors in organizations (Pfeffer, 1981). Perrow (1970), Hinings and colleagues (1974), Pfeffer and Salancik (1974), Hambrick (1981), and Tushman and Romanelli (1983) have used perceptual measures in studies of organizational power.

In light of the questionable validity of relying solely on perceptual measures of power, it seems important to develop relevant objective measures. Pfeffer (1981) argued that "representational" indicators of power allow researchers to assess power more objectively than perceptual measures. Representational indicators of power consider the position of managers in critical organizational and extraorganizational roles (Pfeffer, 1981). These roles might include formal positions in an organization as well as informal liaisons with other organizations.

A number of scholars investigating power have adopted representational indicators to, for example, measure committee representation in universities (Hills & Mahoney, 1978; Pfeffer & Moore, 1980; Salancik & Pfeffer, 1974), signify representation on advisor panels in National Science Foundation funding (Pfeffer, Salancik, & Leblebici, 1976), and represent board prestige in human service agencies (Provan, 1980).

Objective indicators of power are valuable because they do not suffer from the same drawbacks as perceptual measures. However, objective indicators tend to be somewhat removed from the source of power; they provide secondhand information. Hence, the best approach might entail using both objective and perceptual indicators (March, 1966; Pfeffer, 1981; Provan, 1980).

In this research, I placed special emphasis on the development of objective indicators of top managerial power. However, because there have not been many attempts to measure power at the top managerial level, I also measured power perceptually to test for convergent validity. In addition, multiple objective indicators were developed, since any one measure of power may not capture the full complexity of the construct.

Structural Power

Structural power is related to the distribution of formal positions within an organization. The greater managers' structural power, the less their dependence on other members of the dominant coalition. A manager's formal position can be captured by examining formal titles and relative compensation. Titles clearly relate to hierarchical authority, and managers' compensation is a precise, though less formal, statement of their standing in an organization.

Three variables were used to create a structural power scale:

Percentage with higher titles. This variable was the percentage of individuals in a firm's dominant coalition with higher official titles than a focal executive. The CEO is rated 0 on this variable, and the least powerful members of the dominant coalition are rated highest. For example, in a team consisting of CEO, president, executive vice president, and vice president, the last manager would rate 0.75. Because firms differ in the hierarchy of titles they use, company annual reports are useful in identifying hierarchical relationships. Numerous studies have used variants of this measure (e.g., Perrow, 1970).

Compensation. This variable was defined as the total cash compensation (salary, bonus, and miscellaneous benefits) of an executive divided by the compensation of the highest paid manager in the same firm, as reported in company proxy statements. (In the case of the top earner in a firm, I used the pay of the second highest paid manager as the denominator in the ratio to avoid restricting the maximum score to 1.00.) Compensation committees set pay scales both across and within hierarchical levels (Simon, 1957), creating pay differentials that provide information on relative power (Whistler, Meyer, Baum, & Sorensen, 1967). Hence, compensation can be considered an important indicator of formal power (Hambrick & D'Aveni, 1990).

Number of titles. This variable was defined as the number of official titles a manager has, as stated in annual reports. Values for the variable typically range from 1 to 3, with a high number of official titles indicating greater power (Harrison, Torres, & Kukalis, 1988). For example, Harrison and colleagues (1988) found that CEOs that also carried the title of board chairperson were more powerful than CEOs without the additional title.

Ownership Power

The agency relationship that is central to ownership power suggests that shareholdings are relevant indicators of power. Managerial shareholdings reduce board influence and the accompanying uncertainty that powerful boards can create for dominant coalitions. In addition, a manager's familial links with other officers and a board enhance ownership power by bypassing traditional sources of board control. Hence, indicators of ownership power, available in company proxy statements, are:

Executive shares. This variable was defined as the percentage of a firm's shares owned by an executive and his or her spouse and dependent children. This is perhaps the most direct means of assessing a manager's ownership power, and it has often been used in the literature on corporate control (e.g., McEachern, 1975).

Family shares. This variable was defined as the percentage of a firm's shares owned by an executive's extended family (brothers, father, and so forth). This variable encompasses an additional aspect of ownership structure by focusing on the shareholdings of a manager's family as a base of support (Finkelstein & Hambrick, 1989).

Founder or relative. Ownership power may also derive from a manager's personal relation to other powerful managers. Hence, the third indicator is based on two types of such associations: (a) the manager is the founder of the firm, or is related to the founder, and (b) the manager has the same last name as another officer. Values for the variable range from 0 to 2, as follows: 0, neither (a) nor (b) is true; 1, either (a) or (b), but not both, is true; and 2, both (a) and (b) are true.

Of course, having the same name as another officer does not automatically imply familial relation. However, in most cases it is possible to determine whether two managers are related by the information provided in company proxy statements. Even failing such determination, it does not seem unreasonable to assume that two top managers with identical surnames are related, given that firms typically have few officers. To the extent that this assumption is false, the measure of ownership power will be slightly overstated in some cases. Kosnik (1987) found that positive values on a similar measure were associated with the granting of "greenmail" by boards of directors.[1]

Expert Power

In the context of strategic decision making, expertise may be defined as the ability to deal with environmental dependencies. One way of assessing such coping capability, and one that is consistent with my concern for objective measures of power, is to examine functional expertise (Fligstein, 1987; Hambrick, 1981; Pfeffer & Salancik, 1978). Top managers with functional experience in a particular area can be said to be expert in that area. Hence, the top managers who can best deal with environmental requirements and who are well situated to cope with critical contingencies will be those with appropriate functional expertise. In addition, the breadth of managerial assignments over a career increases exposure to environmental actors and enhances an executive's ability to manage the relationships that grow out of such contact.

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[1] Alternative definitions of this variable, such as dummy variables for being a founder or having the same name as another officer, were also considered. The variable was chosen because it provides more information than either alternative and facilitates construction of scales.

Information from study 1 and from proxy statements confirmed that 17 of 21 managers (81%) with the same last name as another manager were definitely related. Hence, examining proxy statements appears to be an effective way to verify whether managers with the same last name are of the same family.

Three variables were used to measure expert power:

Critical expertise power. Three steps were involved in creating this variable. First, the key environmental requirements facing organizations were determined. On the basis of the work of Katz and Kahn (1966), Miles and Snow (1978), and Hambrick (1981), four major types of environmental requirements can be specified that correspond to different sources of uncertainty in the task environment of organizations: inputs (supply conditions are the source of uncertainty), outputs (demand conditions), throughputs (production processes), and regulatory concerns (managing regulatory conditions). Key environmental requirements can be assessed by counting the number of articles over the time period of interest cited in the *Funk & Scott Predicasts*[2] that emphasize each of the four categories of environmental requirement. In addition, reviewing archival data on each environmental requirement qualitatively can serve as a check on the accuracy of the *Funk & Scott* analysis. There is a great deal of information available on environments and industries to facilitate such a qualitative analysis, including industry trade publications, industry surveys from the business press and industry analysts, and government-generated industry reports. This method maximizes rigor without losing qualitative richness.

Second, I identified all functional areas that managers had direct experience in, using *Dun & Bradstreet's Reference Book of Corporate Management*. And third, I assessed critical expertise power by matching functional experience with environmental requirements, as follows: inputs—purchasing, personnel, exploration; outputs—sales and marketing, product R&D; throughputs—operations, accounting, process R&D; and regulatory concerns—government service, law (Hambrick, 1981; Miles & Snow, 1978). The actual measure was calculated by summing the proportions of citations in each environmental requirement area in which a focal manager had corresponding functional experience. For example, if the distribution of citations from the analysis of *Funk & Scott* is inputs, .10, outputs, .50, throughputs, .25, and regulatory concerns, .15, then a manager with functional experience in marketing and law would score .65. The range of this variable is from 0 to 1.

Functional areas. This item is a straight count of the number of different functional areas a focal manager had experience in. It is a broader measure of experience that does not limit itself to only those functional areas deemed important by the *Funk & Scott* criterion. As such, it recognizes that managers with a broader background may be better able to cope with multiple stakeholders from a firm's task environment.

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[2] The *Funk & Scott* directory lists articles from the business and trade press in a given year. Organized by industry, the directory lists the titles of articles by categories like "raw materials," "demand," and "regulations." Assigning each title in each category to one of the four environmental requirements and counting the totals is an efficient way to measure the significance of different environmental contingencies to a firm. O'Reilly and Flatt (1989) used this data source to measure the innovativeness of firms.

Positions in firm. The greater the number of different positions a manager has had in a firm, the wider his or her range of interaction with environmental actors. This variable encapsulates the idea that the variety of assignments managers undertake as they progress in their careers provides valuable data on a firm and its environment. In addition, because different positions often involve different geographic and product-related assignments, the more positions managers have had, the greater the breadth of their contacts with elements of a firm's task environment. Given that most managerial jobs involve a boundary-spanning role that promotes interaction with the task environment (Mintzberg, 1973), by the time managers join the dominant coalition they may very well have developed a set of relationships they can tap to help manage environmental interdependencies. *Dun & Bradstreet* provided data on this variable.

Prestige Power

Prestige power is related to a manager's ability to absorb uncertainty from the institutional environment. The four indicators below emphasize the role of outside directorships and education as key components of prestige.

Corporate boards. This variable was the total number of corporate boards of directors a manager sat on. Research on directorships has suggested that managers may use board memberships to manage interorganizational dependencies (Pennings, 1980; Pfeffer, 1972) or to establish and maintain contact with other important people in the business elite (Allen, 1974; Useem, 1979). The former perspective is consistent with the informational role of prestige power, and the latter with the symbolic aspects of the construct. Top managers enhance their own, and their organizations', legitimacy in the institutional environment by serving on boards. Only the boards of nonaffiliated corporations were included; for instance, being on the board of a firm's subsidiary was not counted. The greater the number of directorships, the greater the prestige score for an executive.

Nonprofit boards. This variable was the total number of nonprofit boards a manager sat on. Service to the community is an important aspect of a manager's membership in the elite (Useem, 1979). In addition to providing social contact for members, nonprofit boards often bring together many influential people in a forum that facilitates information exchange. For a nonprofit directorship to be counted, a manager had to be part of the top decision-making or consultative arm of an organization; simple membership in the organizations did not count. Both corporate and nonprofit boards were identified from company proxy statements and *Standard & Poor's Directory of Directors*.

Average board rating. This variable was the average stock rating from *Standard & Poor's Stock Surveys* for all corporations of which a manager was an external director. This variable explicitly measures the financial standing of the firms for which a manager is a board member by using the Standard & Poor's rating of their general financial condition. It is more prestigious to sit on the board of AT&T than it is to be a director of a struggling, relatively unknown firm.

Elite education. Prestige power may also derive from a manager's educational background (D'Aveni, 1990). Attendance at certain schools carries with it an aura of prominence in the business elite (Clement, 1975; Domhoff, 1967). Membership in this elite group connotes considerable prestige in the institutional environment. Because candidates for institutional governance often come from this elite group (Useem, 1979), top managers with elite educational backgrounds may be more influential within a dominant coalition. Hence, a fourth indicator was based on the rated prestige of the schools, listed in *Dun & Bradstreet*, a manager has attended. The variable, with values ranging from 0 to 3, was created as follows:[3] 0, no formal higher education; 1, undergraduate and graduate schools are both nonelite; 2, undergraduate or graduate school (but not both) is elite; 3, both undergraduate and graduate schools are elite.

A comprehensive list of elite educational institutions can be developed from work by Useem and Karabel (1986) and a survey in *U.S. News and World Report* (1987). Relying on classic work by Coleman (1973), Pierson (1969), and Blau and Margulies (1974–75), Useem and Karabel listed the most highly ranked institutions for undergraduate education, M.B.A. programs, and law degrees. The *U.S. News & World Report* (1987) survey lists the top ten liberal arts colleges. Brown University, which is part of the Ivy League but was not included by Useem and Karabel, the U.S. Military Academy, and the U.S. Naval Academy complete the list of prestigious institutions used here. Although no such inventory of elite schools can be definitive, this list does appear to have considerable face validity and is similar to those used in previous studies. It is reported in Appendix A.

VALIDITY OF OBJECTIVE POWER MEASURES

This section outlines how the power dimensions were validated. Three studies were conducted. In the first, the four dimensions of power were measured for 1,763 top managers working in 102 firms over five years (1978–82). The firms were 36 computer, 36 chemical, and 30 natural gas distribution companies drawn from populations of the largest firms in each industry as listed in *Ward's Directory of 50,000 Largest U.S. Corporations* for which data were available on top managers' power for all fiscal years studied. Because expert power concerns critical environmental contingencies, examining multiple industries was thought desirable. I chose the three industries because they represented different contexts in which dominant coalitions must manage. The computer industry was dynamic, offering significant discretion to top managers. The natural gas distribution industry was effectively regulated, constraining managerial initiatives. The chemical industry fell somewhere between those two industries, with elements of both stability and flexibility present (Hambrick & Finkelstein, 1987). I restricted the study to large firms because data on top managers of smaller firms are often inaccessible, and a relatively homogeneous set of firms was required to ensure comparability. However, the large number of firms and variety of industries examined add some external validity.

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[3] Several alternative specifications were also considered, such as the degree of education and dummy variables for attendance at prestigious undergraduate or graduate institutions. I chose this variable because of the added information it provides and its facilitation of scale construction.

In the second study, top managers from each of the 102 firms were asked to rate managerial power. I then compared a perceptual measure of power to objective measures in a test of convergent validity.

The third study investigated the predictive validity of the power dimensions by examining the association between top-management-team members with financial functional backgrounds and firms' diversification postures and acquisition activity. Using the data from study 1, I compared regression coefficients from a series of models, one with the straight proportion of top team members with finance backgrounds as the independent variable, and the others using power-weighted measures of the same proportion. The three studies are described below.

Study 1

Data were gathered for each indicator of power for each member of the dominant coalition of the 102 firms for every year from 1978 through 1982. Inside board membership was the criterion used to identify dominant coalition members. Sitting on a firm's board of directors is an objective, formal indicator of membership in the inner circle of its top managers, the group that has ultimate responsibility for setting policy (Thompson, 1967). As such, inside board membership is closely related to Cyert and March's (1963) conceptualization of the dominant coalition. In addition, inside board membership represents an absolute cutoff between top managers and other managers that is analogous across firms and industries. Managers who are also directors have access to more information than other managers do. And because there are often constraints on the number of inside board members in a firm, appointment to the board is often a clear indication of a person's membership in the inner circle. The full group of managers consisted of 1,763 dominant coalition members; the average number of managers in a dominant coalition was 3.5.

Table 1 reports descriptive statistics for each of the variables making up the power dimensions. Data from all five years were pooled to simplify reporting. Although the significance of the correlation coefficients may be somewhat overstated because of the pooling of the data, a year-by-year analysis of correlation matrices indicated a similar pattern over time. The correlations in Table 1 reveal a pattern that appears to support the measurement

TABLE 1
Descriptive Statistics and Correlations of Items Measuring Power[a]

			Correlations											
Variables	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11	12
1. Percent with higher titles	0.31	0.25												
2. Compensation	0.84	0.53	−.64											
3. Number of titles	1.38	0.58	−.63	.60										
4. Executive shares	0.01	0.05	−.20	.21	.12									
5. Family shares	0.01	0.03	−.09	.05	.06	.54								
6. Founder or relative	0.10	0.41	−.16	.08	.04	.45	.54							
7. Critical functional experience	0.31	0.24	−.03	−.08	.03	−.07	−.02	−.08						
8. Functional areas	1.31	0.54	−.10	.01	.06	.05	.10	.08	.57					
9. Positions in firm	4.14	2.82	−.08	−.05	.08	−.12	.05	−.07	.38	.35				
10. Corporate boards	1.00	1.49	−.34	.33	.32	.08	.02	.03	−.02	.03	.14			
11. Nonprofit boards	0.68	1.69	−.14	.13	.17	−.08	−.04	−.09	.06	−.03	.14	.38		
12. Average board rating	1.92	2.48	−.37	.34	.33	.03	.01	−.01	−.01	.05	.16	.61	.39	
13. Elite education	1.32	0.82	−.04	.03	.03	.01	.07	.02	.14	.04	.14	.16	.23	.28

[a] N = 1,763. Correlations greater than .05 are significant at $p < .05$.

methodology presented earlier. However, to evaluate the power dimensions and their measurement more closely, I selected three related criteria. First, how well did the items designed to measure a construct converge by loading together as a single factor? Second, how internally consistent were the items that made up each construct? And third, how well did items designed to measure other constructs discriminate by breaking out as different factors (Kerlinger, 1973; Van de Ven & Ferry, 1980)? I constructed a scale for each power dimension by adding up the normalized values (after standardizing by industry and year) of each variable making up the scale.

The first criterion was assessed by conducting a principal components factor analysis of all 13 items comprising the four power measures. I extracted factors with eigenvalues greater than one, using an oblique rotation because I expected specific components of power to be interrelated.

As the results shown in Table 2 indicate, four factors were identified, with loadings (using a conventional cutoff of .40) that were consistent with expectations. Variables loaded onto all four factors in a pattern that was identical to each construct's dimensions.[4] Hence, the first criterion was met.

Internal consistency was assessed in several ways, as shown in the first four columns of Table 3. First, I calculated Cronbach alphas to obtain reliability estimates for each dimension. Although there are no standard guidelines available on appropriate magnitudes for the coefficient (Van de Ven & Ferry, 1980), in practice an alpha greater than .60 is considered reasonable in organizational research (Eisenhardt, 1988; Van de Ven & Ferry, 1980). Hence, all four power dimensions demonstrated internal consistency. Table 3 also provides data on the average item-scale correlation and the range of alphas that emerged when a set of subscales was created for each scale by dropping a different item in each subscale. The average item-scale correlations were at least .71, and the ranges of alphas across subscales were reasonably consistent, indicating strong support for scale construction. In addition, the average alphas for these subscales were only moderately lower than the full-scale alphas. Overall, these tests indicate that the power dimensions were internally consistent.

The third criterion, which concerns discriminant validity, was assessed in three ways. First, as the factor analysis reported in Table 2 indicates, each of the variables loaded onto only one factor in a pattern that was consistent with predicted structures. Second, as reported in column 5 of Table 3, the median correlation of each item with other items making up other scales was less than the median correlation of each item with variables making up the scale of which the item was part. Although there is no standard guideline for this test, Campbell and Fiske (1959) suggested that any difference in median correlations is sufficient to established discriminant validity, a benchmark the power dimensions easily surpassed. The third test of discriminant va-

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[4] Factor analysis was also performed on each set of variables making up a separate power dimension. Unidimensionality was established for each dimension since only one factor emerged with an eigenvalue greater than one in each factor analysis (Bagozzi, 1980).

TABLE 2
Rotated Factor Patterns[a]

Variables	Factor 1: Structural Power	Factor 2: Ownership Power	Factor 3: Expert Power	Factor 4: Prestige Power
Percent with higher titles	**−.84**	−.06	−.08	−.02
Compensation	**.86**	.00	−.08	.00
Number of titles	**.84**	−.06	.07	.02
Executive shares	.14	**.77**	−.06	−.05
Family shares	−.10	**.86**	.07	.06
Founder or relative	−.00	**.81**	−.02	−.03
Critical functional experience	−.03	−.07	**.85**	−.03
Functional areas	.10	.10	**.84**	−.12
Positions in firm	−.07	−.06	**.65**	.24
Corporate boards	.23	.02	−.07	**.67**
Nonprofit boards	−.09	−.10	−.05	**.75**
Average board rating	.21	−.01	−.04	**.73**
Elite education	−.33	.15	.10	**.67**
Variance explained				
Proportional	.24	.16	.14	.11
Cumulative	.24	.40	.54	.65

[a] N = 1,763. Bold print highlights the factor loadings with absolute values greater than .40.

lidity requires a variable to be more highly correlated with its own scale than with other scales. Table 3 (column 6) again illustrates that each variable meets this test, with differences in correlations of at least .30 in all cases.

In sum, the results of study 1 provide strong support for the reliability and validity of the power dimensions.[5]

Study 2

The second study asked top managers to evaluate power in their firms. A questionnaire was sent to 499 top managers who held office in studied firms in 1981. My rationale for using a questionnaire was as follows. First, because some of the objective power measures had not been used before, I sought a second source of data. Obtaining perceptual measures from survey data was the only feasible way of achieving this goal, given the number of firms studied.

Second, the use of two completely different methods of data collection was thought highly desirable for establishing validity in view of the sugges-

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[5] I applied the same tests to the data on a year-by-year basis to examine the stability of results over time and to ensure that pooling the data over five years introduced no bias. Results from both factor analysis and the set of validity and reliability tests reported in Table 3 were similar in pattern to those reported here.

TABLE 3
Validity of Objective Measures of Power[a]

Variables	Cronbach Alphas	Average Item-Scale Correlations	Range of Alphas	Average Alphas	Median Correlations[b]	Differences in Correlations[c]
Structural power	.83	.87	.75–.78	.77	.53	
Percent with higher titles						.50
Compensation						.50
Number of titles						.50
Ownership power	.76	.82	.62–.70	.67	.49	
Executive shares						.54
Family shares						.77
Founder or relative						.73
Expert power	.70	.75	.52–.73	.60	.34	
Critical functional experience						.75
Functional areas						.66
Positions in firm						.51
Prestige power	.67	.71	.51–.72	.60	.29	
Corporate boards						.30
Nonprofit boards						.48
Average board rating						.35
Elite education						.48

[a] N = 1,763.

[b] Median correlation of items in scale minus median correlation of items in scale with all nonscale items.

[c] Correlation of item with scale minus largest of the correlations of item with other scales.

tions of numerous scholars concerning multiple measures of power (March, 1966; Pfeffer, 1981; Provan, 1980).

Two major problems in obtaining survey data were reconciliation of data with the time period of the study and the possible unwillingness of top managers to respond to a questionnaire on as sensitive a subject as power. As to the first concern, stated simply, how reliable are managers' recollections of events in the past? The questionnaire, administered in 1986, asked about events in 1981. To assess this problem, I gave special attention to interrater reliability. As will be reported below, I found strong agreement among multiple respondents from single firms. However, the potential difficulty of recalling past events necessitated that the questionnaire address only one year, and not all five years for which data were available from archival sources.

The problem of sensitivity can also be assessed for potential bias. If overall response rates are good, it can reasonably be concluded that respondents were not reluctant to discuss sensitive issues. In a pilot study sent to 75 managers in 16 firms, 40 percent responded, a reasonably high response rate in light of the difficulties discussed above.

The survey instrument listed the top managers from a respondent's firm. Respondents were asked to indicate each individual's amount of influence on decisions concerning major resource allocations; organizational redesign; and acquisitions, divestments, and entering or exiting major markets. Appendix B gives full details on the perceptual power measure. This approach to measuring power is consistent with recent work by Hambrick (1981) and Eisenhardt and Bourgeois (1988).

The response rate was 34.5 percent, quite good given the sensitivity of the questionnaire and the level of manager queried (Norburn & Birley, 1986). Of the 172 respondents, 31 were chief executives, and an additional 113 were inside board members in 1981 (28 respondents were senior managers who did not sit on their firms' boards). More than 60 percent (104) requested a summary report of survey results, reflecting their interest in the topic and perhaps the seriousness of their responses. The respondents represented 83 of the 102 firms chosen and provided data on 271 inside board members. I evaluated nonresponse bias by (1) comparing demographic characteristics, such as tenure in a firm, tenure in a position, functional background, and education, and the power scores of respondents and nonrespondents, and (2) comparing the 83 firms with survey data to the 19 for which there was no respondent on sales, numbers of employees, ages, and profitability. In both cases, there were no statistically significant differences, indicating that there was no nonresponse bias.

A test of survey validity came from examining the responses of multiple respondents from single firms. There were two or more respondents from one firm in 53 cases. I examined perceived power ratings from the survey for these 53 cases for multirater agreement using either the Spearman rank correlation or the Kendall coefficient of concordance. Table 4 shows results, reporting both the value of the statistic and its significance. Results show

TABLE 4
Multirater Reliability of Survey Respondents

	Number of Respondents in Firm			
	Two	Three	Four	Five
Average of statistic[a]	.80	.80	.78	.98
Range	.4–1	.5–1	.5–.9	
Percentage significant at 5 percent	48	35	0	0
Percentage significant at 1 percent	19	47	88	100
Percentage significant, total	67	82	88	100
Number of firms	27	17	8	1

[a] For two respondents, Spearman rank correlation was used. For more than two, the Kendall coefficient of concordance was used.

very strong interrater agreement irrespective of the number of respondents in a firm. Fully 40 of the 53 multirater cases (75%) demonstrated significant interrater reliability at the 5 percent level or better. Of the nine cases with 4 or 5 respondents in the same firm, the Kendall coefficient of concordance was significant at the 1 percent level in all but one instance. These tests appear to support the use of the perceived power measure to assess convergent validity.

Table 5 provides descriptive statistics and correlations for objective and perceptual measures of power. Perceived power was positively correlated with structural, ownership, prestige, and expert power, significantly in three of the four cases. Only the correlation with expert power failed to reach significance. The magnitude of correlations indicates that, among the three objective power measures for which significant results were found, differences existed. Structural power was most strongly associated with perceived power, supporting the importance of managers' legitimate power. Interestingly, it was prestige power that demonstrated the next highest correlation, with ownership power exhibiting a weaker (though still significant) association. Managers with ownership power, though still powerful, may be less

TABLE 5
Descriptive Statistics and Correlations of Measures of Power[a]

			Correlations			
Variables	Means	s.d.	1	2	3	4
1. Structural power	0	2.61				
2. Ownership power	0	2.45	.17***			
3. Expert power	0	2.24	.05*	−.08**		
4. Prestige power	0	2.82	.43***	.01	.15***	
5. Perceived power	14.0	4.77	.72***	.18**	.08	.42***

[a] $N = 1,763$, except for correlations of perceived power, where $N = 271$.

* $p < .05$

** $p < .01$

*** $p < .001$

involved in the actual management of firms since perceived power is based on managerial influence in strategic decision making.

Overall, given that reported correlations were of measures from two different data sources, these results establish convergent validity and provide strong support for three of four objective power measures.

Two additional points are worth making. First, although structural and prestige power were correlated at .43, a "stepwise" regression analysis demonstrated significant independent effects on perceived power for both of these measures; the increment in R^2 was significant at $p < .01$. Hence, this analysis confirmed that structural and prestige power were both independently associated with perceived power. Second, significant associations were found even though perceived power exhibited only limited variance with a coefficient of variation equal to 0.34.

Study 3

The purpose of this study was to test the predictive validity of the power dimensions by examining how consideration of power improves the predictability of important strategy variables. Given that the focus of this research was top managers' power, the strategic relationship examined was a basic one that has garnered some support in previous work. Specifically, I studied the association between top-management-team members' functional backgrounds in finance and firm diversification posture and acquisition activity. The inclusion of power in analyses was expected to increase the strength of this relationship. Predictive validity would be established if the association between managers' backgrounds in finance and diversification posture and acquisition activity was stronger when the power of top managers was considered than when it was not.

A great deal of evidence supports the contention that the functional backgrounds of its top managers are related to a firm's strategy (Chaganti & Sambharya, 1987; Dearborn & Simon, 1958; Gupta & Govindarajan, 1984; Hitt & Ireland, 1985; Hitt, Ireland, & Palia, 1982; Hitt, Ireland, & Stadter, 1982; Snow & Hrebiniak, 1980). For example, recent work by Hitt and Tyler (1991) showed a relationship between functional backgrounds and strategic acquisition decisions. Much of this work is consistent with the view that top managers' backgrounds and experiences influence the strategic choices they make (Hambrick & Mason, 1984).

Functional backgrounds in finance are expected to be associated with diversification posture and acquisition activity for several reasons. They include (1) the tendency of executives from peripheral functions such as finance "to pursue strategies that fit with their relative deficiencies in 'hands-on' experience" (Hambrick & Mason, 1984: 199), (2) the likelihood that financial executives will attempt to achieve financial synergies, (3) the likelihood that top managers with financial backgrounds will be more capable than other managers of making a deal and building the capital structure that would facilitate such activity (Hitt & Ireland, 1985), and (4) the belief that the managerial job in diversified firms often resembles that of managing a financial portfolio, an activity in which financial executives typically have some expertise (Berg, 1969; Gupta, 1984; Rumelt, 1974; Salter & Weinhold, 1979). Song (1982) surveyed 53 chief executives of diversified firms and found that acquisitive diversifiers had more CEOs with backgrounds in finance and law than internal diversifiers. Smith and White (1987) found that unrelated diversified firms were more likely than firms with other diversification patterns to select CEOs with functional backgrounds in finance. As a result, the proposition that functional backgrounds in finance are associated with diversification posture and acquisition activity appears to have both theoretical and empirical support.

This idea was tested with the same group of top managers used in studies 1 and 2. I examined top managers' functional backgrounds to ascertain the identities of those with dominant experience in finance. I did not count managers who had spent some time in finance but more time in other areas to ensure that only managers with a clear financial orientation would be included. The proportion of a top team's members with financial functional backgrounds was the main independent variable.

Three of the four power dimensions were examined in this study. Because two of three items composing the expert power scale were based on functional backgrounds, I dropped expert power from the analysis to avoid any confounding effects. All items composing structural, ownership, and prestige power were measured for each member of the dominant coalition in each year. However, rather than standardizing these items to create scales, in this study I used relative measures of power because the logic of the proposition required consideration of relative influence among top managers. Hence, managers with financial functional backgrounds were expected to emphasize diversification only if they had the power to do so. And managers had power to the extent that they enjoyed structural, ownership, and prestige power and other top team members did not.[6] Hence, I used three independent variables, one each for structural, ownership, and prestige power, to form measures of the power-weighted proportion of the top team with financial functional backgrounds.

These variables were created as follows: First, I calculated relative power measures by simply taking each manager's rating on a particular item and dividing it by the sum of the entire top team's ratings on the same item. For example, if in a team of five top managers, A served on five corporate boards, B had three directorships, C and D had one each, and E had none, the relative ratings for A through E would be .5, .3, .1, .1, and 0. I created the three power measures by averaging the relative power ratings over the items defining each scale. Second, I calculated the weighted proportion of financial functional backgrounds by summing the relative power ratings of all managers on the team with functional backgrounds in finance. This procedure counted all managers with financial backgrounds but weighted more heavily the more powerful members of the team. For example, if two members of a team of five top managers had financial backgrounds, two had marketing backgrounds, and one an operations background, the arithmetic (unweighted) proportion of team members with financial backgrounds equaled .40. If the two managers with financial backgrounds had relative structural power ratings of .50 and .20, respectively, and the other three managers each rated .10, the structural power–weighted proportion of team members with financial backgrounds was .70. Operationally, I expected this weighted proportion to be more strongly associated with diversification than the unweighted proportion.

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[6] This argument is very much in line with classic work on power by Emerson (1962) and Blau (1964), both of whom emphasized that power is a zero-sum game.

Three dependent variables were used to measure firm diversification posture and acquisition activity. First, I counted the number of four-digit Standard Industrial Classification (SIC) codes for each firm in each year. These data were available from *Standard & Poor's Directory of Corporations* and *Dun & Bradstreet's Million Dollar Directory*. Numerous researchers have effectively used a firm's SIC codes, which describe the types of businesses it competes in, to measure diversification posture (e.g., Montgomery, 1982; Pitts & Hopkins, 1982). For example, Montgomery found that product counts based on SIC codes yielded results that closely paralleled Rumelt's (1974) more intensive approach to assessing diversification.[7] In addition to SIC code data, the actual acquisition activity of the studied firms was measured by counting the cost and number of acquisitions made by each firm each year. I collected these data from *Mergers and Acquisitions*, a magazine that records all acquisitions with a value above $1 million.

Although the goal of this analysis was not to explain diversification posture and acquisition activity but to compare the predictive effects of unweighted and power-weighted measures of the proportion of dominant coalition members with finance backgrounds, I thought it important to include certain control variables, such as size, profitability, and industry membership. Large firms with excess resources often diversify in an attempt to use up slack (Chandler, 1962). In addition, because big firms may find it easier than small ones to raise capital, firm size may be related to diversification activity. Hence, I included the natural logarithm of sales as an independent variable. A second control variable was firm profitability, measured as return on equity. Profitable firms may diversify because they often see marginal returns on additional investment in existing businesses, or alternatively, firms may diversify out of unprofitable businesses (Bass, Cattin, & Wittink, 1977). Regardless of the effect, firm profitability warrants use of a control. Finally, because three different industries were included in the study, I defined two binary variables to control for institutional and other industry effects (Hill & Hansen, 1991). Both firm sales and cost of acquisitions were converted to 1983 dollars to control for inflation.

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[7] I also developed two additional measures of diversification based on the entropy index: total diversification and unrelated diversification. Both are based on the formula $\Sigma P_i \ln(1/P_i)$, where P is the sales attributed to segment i and $\ln(1/P_i)$ is the weight for each segment, or the logarithm of the inverse of its sales. Unrelated diversification was defined as diversification across industry groups (two-digit SIC code categories) and total diversification was defined as diversification across industry groups and arising out of operating in several segments (four-digit SIC code) within an industry group (Baysinger & Hoskisson, 1989; Palepu, 1985). These measures rely on line-of-business data, which were only available for one of the five years of the study (1981) from Trinet, a data base that provides complete information on revenues for each four-digit industry in which a firm is active. Results of ordinary least squares regression analyses of these measures were similar to those to be reported for the number of SIC codes, indicating that the findings of this study were robust.

As stated earlier, data were collected on 102 firms for the 1978–82 period. With some missing data, the pooled cross-sectional time series data sets ranged in size from 490 to 505 firm-year observations. However, the pooled design rendered ordinary least squares (OLS) regression estimates biased because of enduring individual-firm characteristics that are not considered in the model, violating assumptions on independence of observations (Hannan & Young, 1977). As a result, I employed a generalized least squares (GLS) regression procedure suggested by Kmenta (1986) that corrected for the effects of autocorrelation using the Cochrane-Orcutt transformation. I analyzed four separate models for each dependent variable, the first using the unweighted proportion of top team members with finance backgrounds as an independent variable and the next three using the power-weighted proportions. The unstandardized beta coefficients of these four variables were examined to determine if measures of the power-weighted proportion were better predictors of the dependent variables. No R^2s are reported because of problems with their interpretation in GLS regressions (Kmenta, 1986).[8]

Table 6 provides descriptive statistics on the variables used in study 3. Although caution is warranted in interpreting the correlation matrix because of the pooling of the data, the pattern of association is consistent with the hypothesis. The results of the GLS regression analysis for each of the three dependent variables reported in Table 7 offer a much stronger test. Both the unweighted and the three power-weighted measures of the proportion of top team members with finance backgrounds were positively associated with the number of SIC codes, although the association with the unweighted proportion was only marginally significant. The power-weighted proportions were also significant in predicting the cost of acquisitions (ownership power was marginally significant), and the unweighted proportion was not. Finally, finance backgrounds appeared to be unrelated to the total number of acquisitions made, although the sign of the coefficient was negative for the unweighted proportion and positive for the weighted proportions. In all three sets of regression equations, consideration of power yielded stronger results,

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[8] GLS models relax two key assumptions of OLS models; these assumptions are that the variance of the error terms must be equal and the covariance between the error terms must be zero. When these assumptions are relaxed, it becomes problematic to interpret measures of goodness of fit, such as R^2, that depend on the variance.

TABLE 6
Descriptive Statistics and Correlations of All Variables in Study 3[a]

			Correlations[c]									
Variables[b]	Means	s.d.	1	2	3	4	5	6	7	8	9	10
1. Number of four-digit SIC codes	7.75	7.30										
2. Cost of acquisitions, in millions	13.32	99.22	.21									
3. Number of acquisitions	0.30	0.76	.29	.41								
4. Natural logarithm of sales	6.84	1.39	.44	.15	.22							
5. Return on equity	14.39	13.85	−.10	−.02	.03	−.03						
6. Computer industry	0.35	0.48	−.16	−.00	.06	−.25	.04					
7. Chemical industry	0.35	0.48	.45	.08	.11	.20	−.05	−.55				
8. Proportion of TMT with finance backgrounds	0.17	0.20	.23	.07	.02	.17	−.03	−.00	.04			
9. Structural power–weighted proportion of TMT with finance backgrounds	0.16	0.21	.30	.16	.09	.23	−.02	−.02	.07	.93		
10. Ownership power–weighted proportion of TMT with finance backgrounds	0.15	0.21	.30	.12	.05	.23	−.03	−.03	.07	.94	.94	
11. Prestige power–weighted proportion of TMT with finance backgrounds	0.16	0.22	.28	.16	.09	.23	−.02	.01	.07	.88	.91	.88

[a] $N = 505$, except for correlations of the number of four-digit SIC codes, where $N = 490$.

[b] TMT = top management team.

[c] Correlations greater than .09 are significant at $p < .05$.

TABLE 7
Results of Generalized Least Squares Regression Analyses[a]

Variables	Number of SIC Codes[b]				Cost of Acquisitions[c]				Number of Acquisitions[c]			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Intercept	−.53**	−.54***	−.54***	−.55***	−11.97*	−11.31†	−11.10†	−10.87†	−.11*	−.11*	−.11*	−.11*
	(.16)	(.16)	(.16)	(.16)	(5.96)	(5.80)	(5.89)	(5.93)	(.05)	(.05)	(.05)	(.05)
Sales	.96***	.96***	.97***	.96***	6.28*	4.84*	5.71*	4.93*	.06***	.06***	.06***	.06***
	(.07)	(.08)	(.08)	(.07)	(2.44)	(2.31)	(2.41)	(2.29)	(.01)	(.01)	(.01)	(.01)
Return on equity	−.02*	−.02*	−.02*	−.02*	−.28	−.27	−.25	−.28	.00	.00	.00	.00
	(.01)	(.01)	(.01)	(.01)	(.27)	(.26)	(.26)	(.27)	(.00)	(.00)	(.00)	(.00)
Computer industry	1.82**	2.17***	2.09***	2.06***	1.23	−.54	−2.70	−.45	.30**	.26**	.27**	.27**
	(.61)	(.63)	(.62)	(.60)	(17.84)	(17.31)	(17.30)	(16.90)	(.10)	(.10)	(.10)	(.10)
Chemical industry	6.64***	6.49***	6.32***	6.37***	36.75†	34.71†	35.19†	34.55†	.24*	.20*	.22*	.20*
	(.71)	(.74)	(.74)	(.71)	(20.93)	(20.13)	(20.84)	(19.97)	(.09)	(.10)	(.10)	(.10)
Proportion of TMT with finance backgrounds	1.90†				21.03				−.13			
	(.99)				(30.17)				(.18)			
Structural power–weighted proportion TMT with finance backgrounds		2.58**				83.54**				.01		
		(.98)				(29.13)				(.18)		
Ownership power–weighted proportion TMT with finance backgrounds			2.81**				49.34†				.00	
			(.97)				(28.89)				(.18)	
Prestige power–weighted proportion TMT with finance backgrounds				2.31**				62.68*				.00
				(.80)				(25.93)				(.16)

[a] Standard errors appear in parentheses.
[b] N = 490.
[c] N = 505.
† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

with clearly significant results in two cases. In contrast, and somewhat surprisingly, the simple proportion of top team members with finance backgrounds was only marginally associated with diversification posture and not at all with acquisition activity. This weak result may reflect the difficulty relatively unpowerful top managers with financial backgrounds face in trying to achieve financial synergies in highly diversified firms (Hoskisson & Hitt, 1990).

The results also indicate that the three power types examined have roughly equal effects on diversification posture but do not have equal effects on acquisition activity. For example, the coefficient for ownership power was only marginally significant, and structural power appeared to be most strongly associated with the cost of acquisitions. The relatively weak result for ownership power is consistent with the results of study 2, which suggested that owners may be less involved than nonowners with the actual management of firms. Hence, although a stronger statement awaits further research, it does appear that ownership power may not translate into active involvement in strategic decision making in the same way that structural and prestige power do.

Overall, the results of study 3 support the contention that top managers are able to influence strategic outcomes to the extent they have power. In addition, this study provides evidence for the predictive validity of the power dimensions developed.

DISCUSSION AND CONCLUSIONS

In this article, I have argued that top managers' power plays a major role in strategic choice. However, although research in strategic management has generally acknowledged this proposition as a reality, empirical work has tended to lag because of difficulties in conceptualizing and measuring power in top management teams. Hence, a central goal of this research was the development and validation of a set of power dimensions and their measurement. The results of three studies strongly supported the validity and reliability as research constructs of structural, ownership, and prestige power. Expert power received moderate support. Study 1 demonstrated that the four dimensions were unidimensional, internally consistent, and discriminantly valid. In study 2, the objective power measures were correlated with a perceived power measure and found to be positively and significantly related in three of four cases, evidence of convergent validity. Finally, study 3 provided support for the predictive validity of three of the four power measures in a test of the association between top managers' functional backgrounds in finance and firm diversification posture and acquisition activity. Although this is clearly only a first attempt, and more work may be needed to refine each of the measures, the four dimensions of top managers' power appear to offer researchers both a framework and a measurement methodology that may greatly facilitate empirical work in this area.

The relationship between managerial characteristics and strategic actions has been the subject of much investigation in recent years (Hambrick, 1989). Much of this work has been based on the straightforward idea that a firm's top managers affect its strategy. The results of the studies reported here clearly suggest that such an upper-echelons theory (Hambrick & Mason, 1984) should be extended to encompass the idea that managerial power affects the association between top managers and organizational outcomes. The ability of top managers to affect firm strategy depends to a great extent on whether they have the requisite power to be influential. As study 3 indicated, variables assessing managerial characteristics that do not encompass the distribution of power among top managers are not as predictive as variables that are adjusted for power. Although in some ways this is not all that surprising a result, this extension to upper-echelons theory is new. This finding is important because it confirms anecdotal evidence on the importance of power in top management teams and suggests that a realistic view of top managers' strategy making must take the distribution of power in a firm into account. Thus, it charges other researchers in this area to consider the role of power in their work.

In a related vein, the results of this study suggest that researchers need to consider both a firm's CEO and the rest of its dominant coalition in assessing if and how top managers affect organizational outcomes. To limit inquiry to only the CEO of a firm is to make an implicit assumption on the distribution of power at the top. Inclusion of power as a variable explicitly recognizes that such an assumption is unwarranted; empirical examination of power allows the data to govern the resolution of the issue. Hence, in both a theoretical and an empirical sense, consideration of power in studies of the association between top managers and organizational outcomes may represent a significant contribution to this research stream.

There are several limitations to the approach to measuring power outlined in this article. First, although I expect the power dimensions to be important in most instances, situational differences may shift the balance of power. For example, a new CEO may begin his or her tenure with a mandate for change, upsetting existing power arrangements. However, it is also likely that a CEO's mandate is somewhat dependent on both structural and ownership power. This dependency suggests a second limitation, namely, that no attempt was made here to identify the factors that affect the relative importance of types of power. It may be that expert power is most salient when a firm is confronted with uncertainty from its task environment, and ownership power is predominant when the board of directors creates uncertainty. Some may argue, however, that structural power is typically of central importance because of the legitimate authority it bestows. The results of studies 2 and 3 do suggest that situational differences in the importance of types of power exist. What accounts for these differences remains an empirical question.

Third, although the conceptualization of power presented here may be relevant in many contexts, the actual measures suggested assume use of a sample of corporate organizations. The ownership power construct is the most clearly context-specific. Nonprofit organizations do not issue stock, rendering measures that use shareholdings ineffective. However, the concept of ownership power remains relevant because top managers in nonprofit organizations must still work with boards of governors or trustees who may have some influence in decision making. In addition, the institutional environment may be more important for such organizations, enhancing the importance of prestige power. So, because different types of organizations create different types of contingencies, some adjustment of the specific measures of power may be required. However, the four power dimensions themselves are likely to be relevant in most organizational settings.

A final limitation concerns the role of political "skill and will" (Mintzberg, 1983). Power has essentially been defined as the capacity to influence strategic choices. I did not address the actual exercise of power and the issues that go with it, which include managers' political acumen and willingness to use power in hand. Nevertheless, although skill and will are important, managers who have reached the top are typically highly skilled politically (Hannan & Freeman, 1977; March, 1984), reducing the importance of political acumen as a differentiating factor.

The present work can help advance future research in several ways. Perhaps most important, studies of the association between managers and strategies can use the proposed measurement methodology. For example, although scholars have investigated many of the original propositions (Gupta, 1984; Hambrick & Mason, 1984; Szilagyi & Schweiger, 1984), few have adopted a top team level of analysis, and none have included power in their formulations. Because all the power dimensions can be measured using archival data sources, it should be possible to incorporate managerial power into studies such as these. In addition, refinements to the measures suggested here will be important in developing this research stream.

The importance of top managers' power to organizations suggests that it may be interesting to examine the distribution of power in teams. In some teams, power may reside in one or two key individuals; other teams may exhibit a more dispersed power distribution. There are several interesting questions in this regard: How stable is the distribution of power over time? What are the consequences of institutionalized power distributions? How does the balance of power change? What is the relationship between the distribution of power and executive succession? It seems clear that there are abundant research opportunities here.

To address such questions requires a recognition of the role of power in strategic choice and a means of incorporating power in subsequent research. I have tried to develop objective measures of power that may help accomplish this goal. Scholars of strategy and organization need to address the issue of top managers' power, especially as theoretical formulations that suggest a major role for power in strategy making are developed and extended.

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APPENDIX A

Elite Educational Institutions

- Amherst College
- Brown University
- Carleton College
- Columbia University
- Cornell University
- Dartmouth College
- Grinnell College
- Harvard University
- Haverford College
- Johns Hopkins University
- Massachusetts Institute of Technology
- New York University
- Northwestern University
- Oberlin College
- Pomona College
- Princeton University
- Stanford University
- Swarthmore College
- United States Military Academy
- United States Naval Academy
- University of California, Berkeley
- University of California, Los Angeles
- University of Chicago
- University of Michigan
- University of Pennsylvania
- Wellesley College
- Wesleyan University
- Williams College
- Yale University

APPENDIX B

Perceptual Power Measure

"Below is a list of executives and their titles at (*name of firm*) in 1981. Please indicate the amount of influence each of these people generally had in affecting the outcomes of each of the types of decisions listed below. Record your responses in the space provided. If your name is included in the list, be sure to rate yourself."

Responses were on a seven-point format anchored by 1, "no influence," 4, "moderate influence," and 7, "total influence." Respondents rated five executives on three decision types: (1) major resource allocation decisions (e.g., capital expenditures or large promotional outlays), (2) organizational redesign (e.g., changing formal structure or selecting and assigning executives), and (3) acquiring or divesting major business units or entering or exiting major markets.

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NONRESPONSE AND DELAYED RESPONSE TO COMPETITIVE MOVES: THE ROLES OF COMPETITOR DEPENDENCE AND ACTION IRREVERSIBILITY

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Competitive moves that are unchallenged or to which response is delayed are important weapons in a strategist's arsenal, so variables that discourage or delay response are of great interest. Using a game theoretic framework, this study investigated the effects on dimensions of competitive response of competitor dependence on a market under attack and the irreversibility of an aggressor's move. The hypothesized relationships were tested with data on competitive moves by U.S. airlines. The results suggest that competitor dependence depresses chances of nonresponse and increases response delay and the likelihood that a responder will match a move. Action irreversibility generally has the opposite effect. In addition, the interaction of competitor dependence and action irreversibility is significant. Analyses of the performance implications of competitive exchange indicated that attackers and early responders gain market share at the expense of late responders and nonresponders.

Firms constantly undertake offensive and defensive actions in their struggle for competitive advantage. Therefore, a basic knowledge of the drivers of competitive rivalry is of paramount importance to strategic management (Chen, 1988; Chen, Smith, & Grimm, 1991; MacMillan, McCaffery, &

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Van Wijk, 1985; Porter, 1980, 1985; Smith, Grimm, Gannon, & Chen, 1991). However, except for the few preliminary investigations cited, almost no attempt has been made to examine directly actual competitive interaction.

As Porter (1980) noted, the ultimate effectiveness of any competitive action depends largely on whether that action goes unchallenged, or, if it does not, on whether the response is delayed; a firm generally benefits most from moves that prevent or delay response.[1] An important issue for strategists, then, is the degree to which they can predict whether a competitive move will go unchallenged.[2]

Game theory is particularly useful for framing such predictions because game theoretic decisions are based on selecting optimal strategies according to the interdependency of the payoffs to both players (Weigelt & MacMillan, 1988). In actual strategic decision situations, the incompleteness of information about payoffs often hampers players, who must therefore make competitive decisions on the basis of estimates of the distribution of payoffs for their opponents. In such circumstances, strategists should welcome any vehicle that significantly reduces the variance of this assumed distribution. This research identified two important yet largely unexplored variables that may play such a role in variance reduction: (1) a competitor's dependence on the markets affected by an action and (2) the irreversibility of a competitive action.

The research had as its unit of analysis the basic building block of competitive interaction, the action-response dyad. The study attempted to explore some fundamental, yet unanswered, questions in competition: Why do some actions fail to elicit responses from competitors, but others provoke rapid responses? When responses do occur, can delay be predicted, and will the challenge match the action or be an escalation?

Drawn from an extensive review of competition in the airline industry, this study used irreversibility of action and competitor dependence to predict the following dimensions of response: (1) the likelihood of nonresponse from a given competitor, (2) response delay, and (3) the likelihood that a response will match an initial move.

THEORETICAL FRAMEWORK AND HYPOTHESES

This study responds to Caves's appeal for research focusing on "rivalrous moves among incumbent producers" (1984: 127). Despite this appeal, only a few attempts have been made to study empirically the issues that shape actual exchanges of action and response, and these studies have confined their focus to actions that provoked responses. In a study of competition in the banking industry, MacMillan and colleagues (1985) found that "organizational inertia" delayed competitive response, but "strategic challenge" accelerated it. Using comprehensive data on airline competition, Chen and colleagues (1991) showed that actions that require substantial implementation effort delay a rival's retaliation. Implementation effort is related to an attacker's degree of commitment and is part of a broader notion of irreversibility examined in the present study.

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[1] An obvious exception is the price leadership signal used to encourage competitors to raise prices too.

[2] Of course, it is possible that an action will fail to elicit a response because competitors view it as a poor strategic decision. It is equally possible that failure to respond may itself be a poor strategic decision. We did not assume that all actions and responses will lead to successful outcomes.

Employing the airline data base at the organizational level, Smith and colleagues (1991) suggested that such organization-related variables as strategic orientation, unabsorbed slack, and structural complexity can explain the general response profile of a firm, its proclivity to react and to imitate, and average response delay and order. Firms' response behavior over time was also found to relate, albeit marginally, to their organizational performance.

Unlike most previous research, which has been conducted at the organizational level, this study restricted its focus to the fundamental level of actions and responses. Underlying this work is a belief, consistent with Caves's appeal, that if scholars are ever to understand the complexity of competitive rivalry, it is important to move the level of analysis down to the basic building block of competition—the competitive action-response dyad. At this very fundamental level, competitors face decision choices whose payoffs are a function not only of what they decide to do, but also of what their opponents decide to do. The action-response dyad is theoretically consequential because it is at this level that actual competitive engagement occurs, in which competitors enact their strategies, test their opponents' mettle and capabilities, defend their reputations, and signal their toughness, via their responses or lack of responses.[3]

The current study represents a refinement and extension of Smith and colleagues' (1991) article and responds directly to their suggestions for future research.[4] Specifically, this research differs from, and complements, Smith and colleagues in two aspects: (1) it investigates competitive actions from a more fundamental and game theoretic level of analysis, and (2) in pursuing a game theoretic approach, it includes both actions that did not provoke response and those that did.

Understanding Action-Response Dyads

The studies cited above focused exclusively on actions that provoked responses, leaving the strategically more important issue of nonresponse unaddressed. Of crucial interest are situations in which a competitive move goes unchallenged and the aggressor is allowed to make a move that provokes no, or minimal, response.

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[3] In game theory terms, the action-response dyad is where signals of true type are exchanged.

[4] Although some of this study's measures appear similar to those of Smith and colleagues, we focused on an entirely different level of analysis, exploring different theoretical questions and constructs.

From the point of view of a strategist, it is important to understand the conditions that will allow a firm to make a competitive move that will be beneficial if there is a lack of, or a delay in, response (Porter, 1980). Whether or not this situation will occur is determined by the payoffs of both the firm that made the move and the firms that could respond. The interdependence of the payoffs associated with competitive moves and countermoves is a fundamental assumption in game theory (Axelrod, 1984; Rasmusen, 1990; Weigelt & MacMillan, 1988). A study of the capacity expansion process in the corn wet-milling industry illustrated this interdependence (Porter & Spence, 1982).

In recent years, game theory approaches have considerably expanded academic understanding of strategic decision making in the face of potential competitive responses, but these investigations have generally been made under strict assumptions of complete information. In the more general case of incomplete information, both strategists and strategy researchers must find ways to estimate the distribution of payoffs for opponents; any technique that can be used to decrease the variance of the estimated distributions of payoffs should be valuable. Weigelt and MacMillan (1988) illustrated how a game theory framework can help to structure and analyze a competitive situation in which information is incomplete. As Camerer (1990) pointed out, such a framework provides a taxonomy useful in helping competitors understand critical variables and identify those that can be used as indicators of actual payoffs. We used such a game theoretic framework to lay out the structure of the action-response decision.

Illustrative Action-Response Game

Figure 1 illustrates a two-person game in which two competitors, Attacker and Defender, are exchanging competitive moves.[5] In predicting whether or not a competitor will respond, it is necessary to assume that Attacker has already made a move in which it has invested a certain initiating cost and has gained market share at the expense of Defender. The value of the share in question will not necessarily be the same to both Attacker and Defender. (The reason for specifying market share instead of simply specifying a payoff will become apparent below.) Defender must now decide whether to respond, aware that if it does not Attacker may make a second move. If both Defender and Attacker stay put, there is no change in the payoff for either of them.[6] However, if Attacker does make a second move, again

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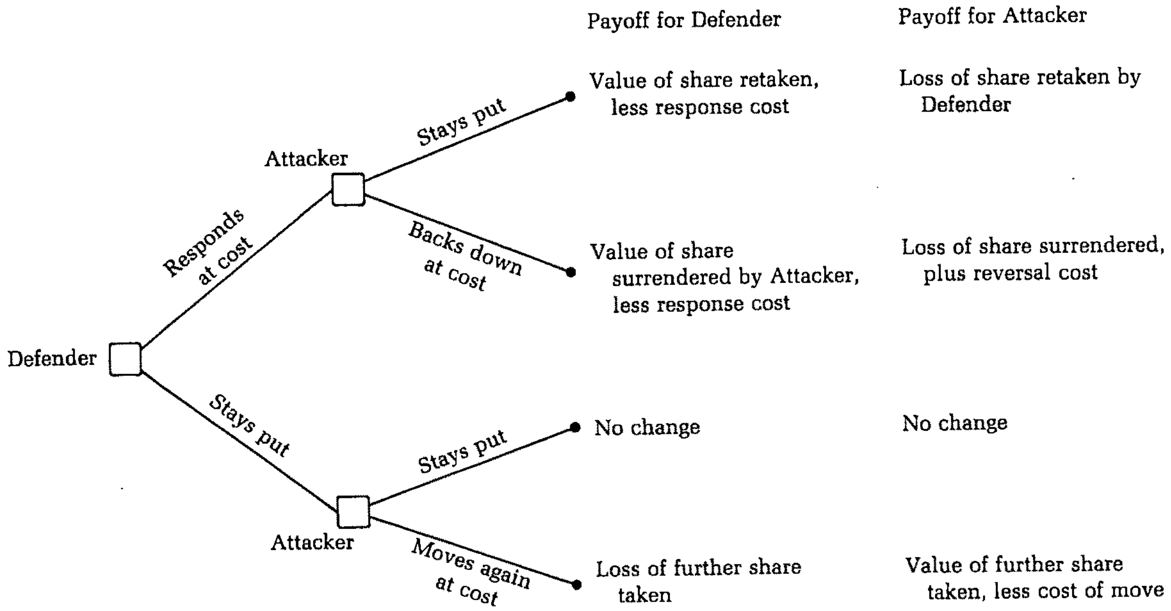
[5] Actual competitive situations normally involve many players. The argument is not materially affected, however.

[6] Implicit in this argument is the understanding that the cost associated with a move is sunk once the move is made and should not enter a player's decision about future moves. That is, once Attacker has made the attacking move, a new competitive era begins. Defender and Attacker should both consider their best strategies and interests from that point on.

FIGURE 1
Game to Illustrate Defender's Problem


Payoff for Defender
Payoff for Attacker
Defender
Responds at cost
Stays put
Attacker
Stays put
Backs down at cost
Attacker
Stays put
Moves again at cost
Value of share retaken, less response cost
Loss of share retaken by Defender
Value of share surrendered by Attacker, less response cost
Loss of share surrendered, plus reversal cost
No change
No change
Loss of further share taken
Value of further share taken, less cost of move

incurring an initiating cost, it gains further share from Defender.

If Defender wants to head off a second attack, it must incur a response cost. Now, if Attacker stays put after the response, Defender will retake a certain market share, so the payoff will be the value of the share retaken, less the response cost. If Attacker backs down, Defender entirely regains the share it initially lost, and the payoff is the value of the share surrendered by Attacker less the response cost.[7]

However, Attacker may incur a reversal cost in backing down, in addition to surrendering the market share it originally gained. Attacker's payoff would then be the loss of the share it has surrendered to Defender plus the reversal cost. Figure 1 depicts the situation Defender faces. (For the sake of simplicity, we ignored the unlikely possibility of a second move against a response by Defender or of Attacker's backing down against no response.)

In the framework of this game situation, three problems arise that need to be addressed in studying and understanding competitive exchange in actual strategic situations.

Estimating Payoffs

To develop a game theoretic solution in real exchange situations, a strategy researcher needs to know the actual values of the payoffs for both the attacker and defender, or more realistically, to assume that the competitors are making decisions with incomplete information. Under conditions of incomplete information, it is hard to tell what the payoffs are for each competitor or to assess the probabilities each will assign to the other player's strategies.

Price moves are clearly a special case of estimating payoffs. Even in the absence of cost data about the players involved, it is much easier for both an attacker and a defender to estimate the marginal effects of price changes than those of other competitive moves. Therefore, any study of action-response characteristics should take special account of price moves, an idea further explored below. For other types of competitive moves, the estimation of payoffs and probabilities is more intractable, so some practical surrogates are necessary for estimating payoffs and probabilities.

This leads to our first research question: Are there variables that can be used to indicate the payoffs and probabilities of each player's strategies? Such variables would act as surrogates allowing estimation of whether a defender will decide not to respond to a competitive move, thereby conceding immunity from retaliation to the initiator.

Relevant research suggests at least two such variables: a defender's competitor dependence on the market or markets under attack, and the irreversibility of the competitive move launched by an attacker.

Competitor dependence. In the illustrative game shown in Figure 1,

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[7] The case in which Defender recovers less than the original share does not change the argument.

Defender, in deciding whether or not to react, must balance the payoff for not responding against the payoff for doing so. Defender has several options here: Depending on the estimated probabilities of Attacker backing down or staying put if Defender responds, Defender must select a strategy to optimize the payoffs.

In every case, except that in which Attacker and Defender both stay put, the share to be gained or lost by Defender is a major determinant of Defender's payoff. Defender's decision about response is thus very sensitive to its dependence for revenues and profits on that part of its total markets that the move has attacked. The more Attacker's move affects Defender's key markets, the greater the payoffs involved for Defender. This reasoning suggests that in the absence of actual payoff data, strategy researchers can use competitor dependence as a surrogate.

Previous research supports employing competitor dependence in anticipating competitive responses. Competitors are generally motivated to respond and to make quicker and stronger responses if they view an action as a threat to important markets (Chen et al., 1991; Dutton & Jackson, 1987; MacMillan et al., 1985; Porter, 1980).

In estimating the likelihood of nonresponse, obviously the reverse applies—low dependence increases the likelihood that Defender will decide not to respond. Hence,

> *Hypothesis 1a: The greater a defender's dependence on the markets under attack, the lower the likelihood of nonresponse.*

Irreversibility. Less obvious, yet potentially just as important as competitor dependence in shaping response, is the irreversibility of an attacker's original move. If Defender in Figure 1 in fact responds, Attacker will back down only if it stands to lose more from Defender's response than it does from surrendering the share it originally took. However, in backing down, Attacker incurs a reversal cost. So the greater the cost of reversing a move, the more likely it is that Attacker will stay put.[8] Further, the more aware Defender is that the reversal cost is high, the more aware it will be that Attacker is unlikely to back down. Therefore, the cost to Attacker of reversing its move is a signal to Defender of Attacker's commitment not to back down and to play tough. Attacker's "true type" (Rasmusen, 1990)—its strategic and behavioral characteristics—can never be fully known without Attacker honestly disclosing this information, an act that is not in its interest and therefore unlikely to occur. Defender therefore must seek signals from Attacker's past or current behavior to infer Attacker's true type. The less certain Defender is of Attacker's true type, or of how fiercely it can be expected to defend its interests, the more important irreversibility is as a signal that Attacker intends to play tough.

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[8] Even if Defender assumes that the value of the share surrendered by Attacker is negative, the reversal cost increases the right-hand side of the inequality and therefore depresses the likelihood of Attacker's backing down.

In the absence of complete information, the cost to Defender itself of reversing such a move is an important estimate of Attacker's reversal cost. The more similar Attacker is to Defender in terms of their scopes of operations, strategies, asset and work force profiles, market shares, degrees of diversification, and so on, the more comfortable Defender can be with using its own costs as a proxy for Attacker's cost structure. Thus, when Attacker and Defender are similar, the more irreversible a move is for Defender, the more irreversible it is likely to be for Attacker, and the more such an irreversible move by Attacker signals its commitment not to back down.

Thus, the irreversibility of any competitive move should be taken into account when predicting responses to a competitive action, since it serves as a credible signal of commitment to the course of action an attacker has undertaken. Schelling (1960) argued that when competitors can make damaging countermoves, one key to success is the aggressor's apparent commitment to an action. In support of Schelling's argument, Porter noted: "Perhaps the single most important concept in planning and executing offensive and defensive competitive moves is the concept of commitment. . . . The persuasiveness of a commitment is related to the degree to which it appears binding and irreversible" (1980: 100–101). This argument is also consistent with Porter and Spence's (1982) research on preempting entry in the corn wet-milling industry.

Clearly, some actions are easier to change or reverse than others, since there are multiple sources of irreversibility: economic, institutional, organizational, psychological, and political. Both economists (e.g., Lieberman, 1987; Spence, 1977) and organization theorists (e.g., Staw, 1981) have emphasized such tangible asset-investment components of irreversibility as capacity and capital cost, so a competitive move involving major expenditures is considered more irreversible than other moves. However, irreversibility can go beyond simple economic investment; an action is highly irreversible if it creates legal or moral obligations to other parties, involves a significant degree of interdepartmental coordination or disruption of systems and procedures in an organization (MacMillan et al., 1985), or is formally approved or announced by senior management or otherwise put in "the social context" of the organization (Salancik, 1977: 408). If the reversal of a competitive move will affect the existing political equilibrium in an organization, the move is more irreversible than it would be otherwise.

Whatever its source, the irreversibility of an action can significantly shape competitors' response behavior since it acts as a strong signal of the true type (toughness) of an attacker. Well noted in the relevant literature but empirically untested is Porter's remark: "If the firm can convince its rivals that it is committed to a strategic move it is making or plans to make, it increases the chances that rivals will resign themselves to the new position and not expend the resources to retaliate or try to cause the firm to back down. Thus, commitment can deter retaliation" (1980: 101). To sum up, the irreversibility of a move can signal commitment, and therefore, the likelihood that a defender will elect not to respond to a competitive move by an attacker is shaped in part by the move's irreversibility.

> *Hypothesis 1b: The more irreversible an action, the greater the likelihood of nonresponse.*

In addition to main effects, competitor dependence and irreversibility may generate an interaction effect. Specifically, recent work on reputation effects (Camerer & Weigelt, 1988; Weigelt & Camerer, 1988) has suggested that an action's degree of irreversibility will moderate the hypothesized relationship between competitor dependence and the likelihood of nonresponse. Those authors showed that under conditions of incomplete information, strong incumbents in a market segment have a vested interest in demonstrating their toughness, in order to discourage others from seeking to increase share in that segment. So when an attacker has made a highly irreversible move in a market that is very important to a defender, it becomes crucial for the defender to signal a willingness to fight, even if the attacker has signaled a willingness to play tough. If the defender does not counterattack, it runs the risk of losing its reputation of willingness to fight for its key markets, thus encouraging further attacks, both from the original attacker and others.

Simply put, although the irreversibility of a competitive move generally increases the likelihood of nonresponse, if a highly irreversible attack is made on markets on which a defender is very dependent, the lines of battle have been drawn for a major market contest, and a counterattack by the defender is called for to protect its position and reputation. Therefore, the likelihood of nonresponse will be low when dependence and irreversibility are both high.

> *Hypothesis 1c: Although the likelihood of nonresponse will generally increase with an action's irreversibility, when high irreversibility and high dependence occur together, this positive relationship will be reversed, and the likelihood of nonresponse will decrease.*

Response Delay

The second problem that arises in developing a game theoretic solution in real exchange situations is the need to take response delay into account. In the game situation shown in Figure 1, if Defender does decide to challenge the move, the time it takes to respond is also a consideration. If Attacker makes a move that gains share and Defender delays its response, then Attacker can generate profits from its gain in share for as long as Defender hesitates. If this period of temporary share gain results in a payoff, then as long as this payoff is greater than the potential reversal cost, Attacker can at a minimum make the move, then back down once Defender reacts.

Thus, response delay is important in that it represents a period during which an initiator reaps the economic benefits of an action,[9] provided the action is effective (Ansoff, 1984; Chen, 1988; Hambrick & Mason, 1984; MacMillan et al., 1985; Porter, 1980; Smith, Grimm, Chen, & Gannon, 1989). As Porter pointed out, "Finding strategic moves that will benefit from a delay in retaliation, or making moves so as to maximize the delay, are key principles of competitive interaction" (1980: 98).

Several empirical studies have shown the payoff implications of response delay. Studying firms responding to various competitive actions in the electronics industry, Smith and colleagues (1981) found a negative relationship between the length of time a firm took to react and its performance. Mansfield (1968) also found that the length of time a firm waited before using a new technique developed by a competitor tended to be inversely related to the profitability of its investment in the innovation. Similarly, Damanpour and Avian (1984) found an inverse relationship between organizations' delay in adopting new technical and administrative ideas and the performance of those organizations.

Furthermore, both Schelling (1960) and Axelrod (1984) drew attention to the fact that response time has important signaling properties—the longer the delay between an action and a response, the less clear the "power" of the signal. The connection between action and response is less obvious than it would be with no or little delay. This point leads to the second research question: When nonresponse is unlikely, can the variables used to estimate likelihood of nonresponse also be used to estimate delay in response?

The same logic used to develop the predictions for the likelihood of nonresponse should be applicable here: both competitor dependence and action irreversibility should influence the eagerness and hence, the speed, with which a competitor will respond.

First, it is likely that competitors will hasten to defend markets they depend on:

> *Hypothesis 2a: The greater a defender's dependence on the markets affected by an attacker's action, the quicker its response will be.*

On the other hand, if an attacker makes a very irreversible move, the defender faces the problem that the attacker is now highly committed to stay the course. This situation suggests that if the defender does elect to countermove, it will be circumspect about reacting and is likely to spend some time conceiving and generating an appropriate countermove.

Chen and colleagues (1991) demonstrated empirically that actions involving a significant "implementation requirement," as measured by the length of time it takes to execute them, are positively associated with competitors' response delay. Implementation requirement, which is related to an attacker's degree of commitment to a course of action, led to the broader notion of irreversibility under examination here.

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[9] This scenario excludes cases in which a competitor is attempting a price leadership signal by raising prices to encourage others to do likewise. In such a case, a response delay is undesirable from the initiator's point of view.

> *Hypothesis 2b: The more irreversible an action, the longer a defender will take to respond.*

Competitor dependence and irreversibility may also create an interaction effect for response delay, with the hypothesized relation between competitor dependence and response delay moderated by irreversibility. Although in general, we would expect high irreversibility to delay response, if a highly irreversible attack is made in markets on which a defender is very dependent, there are at least two reasons for a rapid response: (1) pressure on the defender to defend its reputation (Camerer & Weigelt, 1988; Weigelt & Camerer, 1988) and (2) need to act quickly to ensure that the signal has maximum impact and power (Axelrod, 1984; Schelling, 1960). Thus, response delay will be especially short when both dependence and irreversibility are high.

> *Hypothesis 2c: Although response delay will generally increase with increasing irreversibility, when high irreversibility and high dependence occur together, this relationship will be reversed, and response delay will decrease.*

Matching Response

The third problem in applying game theory to real-world competitive exchanges is the need to assess the likelihood of the special case of a matching response. In the situation Figure 1 illustrates, Defender could undertake a large array of strategies, each of which obviously could be depicted by another branch in the diagram. However, one particular kind of countermove is worth special attention: the matching move, in which Defender simply duplicates the action of Attacker. Matching a move is a powerful signal in its own right (Schelling, 1960), indicating a commitment to defend the status quo, neither giving up position nor escalating the competition into mutually destructive "warfare." Therefore, we posed the following research question: Can the same variables used to predict nonresponse also be used to estimate the likelihood that competitors will exactly match a move that elicits a response?

The same logic used to develop the hypotheses for nonresponse and response delay also applies here, suggesting that a defender with a high dependence on affected markets will tend to match an initial move to signal commitment to defend its markets, but that the greater its dependence, the more it will be inclined to match the move so as to avoid escalation.

> *Hypothesis 3a: The greater a responding defender's dependence on the markets affected by an attacker's action, the higher the likelihood that it will directly match the action.*

The irreversibility of a move should also play an interesting role here: if a highly irreversible attack is made on a market on which a defender is highly dependent, there is great pressure on the defender to protect its reputation by responding, as we argued above. However, there is also a great incentive for the defender to do so in such a way as not to escalate hostilities. Thus, the likelihood of a matching move will be especially high in this situation. We would expect the interaction of irreversibility and dependence to be important in explaining the likelihood of a matching response.

> *Hypothesis 3b: The likelihood of a matching response will increase as dependence increases, and when high irreversibility and high dependence occur together, this positive relation will be augmented.*

Price Moves

The final problem for our analytic framework was the need to recognize the distinctive informational content of price moves. As we have argued, the difficulty competitors face when considering moves and countermoves in situations of incomplete information is that they do not have sufficient data with which to estimate payoffs and hence, probabilities. Also, when it comes to estimating payoffs, price moves are a special case because they impart much more information than other moves. Since price changes directly affect a business's bottom line, it is much easier to estimate their impact on the profits of both an attacker and a defender than it is to estimate the impact of other types of competitive moves.[10] Because of their immediate visibility and the ease with which their effect on market share can be determined, price moves tend to be more provocative than other kinds of moves.

> *Hypothesis 4: When an action is a price move, (a) the likelihood of nonresponse will be lower, (b) response delay will be shorter, and (c) the likelihood of a matching response will be greater than will be the case with other types of moves.*

RESEARCH METHODS

Data

The data for this study concerned the competitive moves exchanged by the 32 U.S. airlines with annual operating revenues over $100 million that were reported in *Aviation Daily* between the years 1979 and 1986. Our data collection method was similar to that of Miller and Friesen (1977); Jauch, Osborn, and Martin (1980) called this method "structured content analysis."

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[10] If sales volumes are reported or can be estimated, and if we have rough estimates of price elasticities, it is possible to make a fairly good estimate of how much a price change will affect the profits of each competitor. Moves not involving price are much more difficult to fathom than price moves because the cost structures of the players are seldom known.

The method also resembles Harrigan's (1980) chronological identification of specific endgame strategic moves taken by firms in declining industries.

The U.S. domestic airline industry was used not only because of its acknowledged competitiveness and rigidly defined boundary, but also because it offers a clearly identifiable set of competitors and a rich source of public information. In addition, the potential influence of the corporate-business relationship on intraindustry competition is low, since almost all airlines are single or dominant-business firms (Rumelt, 1974).

After a survey of various publications, we concluded that *Aviation Daily*, a 50-year-old industry journal, offered the most complete and detailed information on airline competition. Since this publication functions as an industry mouthpiece intended to report objectively airlines' announcements and actions, our potential concern over post hoc rationalization of competitive moves was minimized. Personal interviews with several airline executives and industry analysts confirmed this conclusion.

Identification of Actions and Responses

Competitive moves were identified through an extensive eight-year review of every issue of *Aviation Daily*. This study examined almost all market moves; we excluded internal actions like organizational restructuring. To assure further the strategic significance of price actions, we included only those with a change magnitude greater than 10 percent.

A major challenge in studying competitive interaction is objectively identifying competitive responses (Chen et al., 1991; MacMillan et al., 1985; Smith et al., 1991). We distinguished responses from ordinary actions by searching out such key words in *Aviation Daily* as "in responding to," "following," "match," "under the pressure of," and "reacting to."[11] For example, *Aviation Daily* reported that "*under the pressure of* American Airlines' planned [Nashville] hub creation . . . Piedmont revealed a statewide expansion program in Florida" (July 10, 1985). Thus, Piedmont's Florida expansion was identified as a response to American's hub creation.

Competitive interaction constitutes a complex and dynamic process. The method used was extremely rigorous in tracing actions and responses and in identifying the initial action in a sequence. Step one involved reading chronologically through *Aviation Daily*, searching for all market moves, both actions and responses. Then, to connect all responses to their initial actions, we worked backward through issues of *Aviation Daily*, starting with December 31, 1986, and ending with January 1, 1979. Employing the key word method described above, we first identified responses and then traced back to find the reporting of the initial actions. An important strength of the method lies in its ability to identify every initial action and all responses to it reported in *Aviation Daily*.

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[11] Certainly, a set of similar competitive moves may be motivated by a common industry change rather than by one another. To exclude such moves from the study, we supplemented the key word search method described in the text with additional analysis. Thus, the data include only confirmed action-response pairs. We thank an anonymous reviewer for bringing this issue to our attention.

The total data set consisted of 856 actions, 103 of which provoked at least one response, and 203 responses.[12] To test the accuracy of the information published in *Aviation Daily*, we drew a random subgroup of 20 moves and tried to find evidence of them in other major business publications and newspapers. We thus cross-validated 17 moves; the high degree of confirmation (85%) indicates the reliability of the data.[13]

The first author and three doctoral students in the field of strategy then classified all the actions and responses into the 13 generic types presented in Table 1.

Measurement

Competitor dependence was defined as the extent to which a competitor relies on the markets affected by an action. We first identified the competitors affected by each action for the airlines providing service in at least one studied airport affected by the action. The airports studied were the 37 U.S. "large air traffic hubs" as defined by the U.S. Department of Transportation. The competitor dependence of an action for each affected competitor was defined as the proportion of the passengers served by an airline in the year an action was taken affected by the action. For example, if an airline served 250,000 passengers in a particular year, of whom 50,000 were affected by an action, we assigned a competitor dependence measure of 0.2 to this airline for this action. All required data were drawn from the Department of Transportation's *Airport Activities Statistics of Certified Route Carriers*.

The *irreversibility of competitive moves* was assessed using a questionnaire mailed to 430 senior airline executives and experts. We constructed the mailing list primarily from the winter 1989 edition of *World Aviation Directory*. The respondents represented the highest-level executives and experts associated with the airline industry.

Of 430 questionnaires distributed, 177 were returned (a 41 percent response rate), of which 176 were usable. The ten-page questionnaire was substantially pretested and professionally produced. A personalized letter guaranteed the confidentiality of the responses, and two follow-up mailings were sent to initial nonrespondents. These practices may account for the 41 percent response rate, considered high for any kind of mail survey (Warwick & Lininger, 1975) and, in the opinion of industry experts, exceptionally high for a survey in airline-associated industries.

A statistical comparison of respondents and nonrespondents indicated they did not differ in such surface characteristics as firm size, industry

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[12] This study shared the data base Smith and colleagues (1991) used for actions provoking responses; however, we also included 753 actions that did not provoke responses.

[13] The accuracy of the data reported in *Aviation Daily* is illustrated further by the fact that corporate executives at the level of senior vice president or higher formally announced 45 percent of the competitive moves from two years' data.

TABLE 1
Types of Competitive Moves and the Dimensions Used to Assess Irreversibility

Moves	Irreversibility Index[a]	Irreversibility Dimensions
Price cut	2.660	Amount of financial investment required for implementation
Promotion	2.067	Amount of management effort required for implementation
Service improvement	2.276	Degree of disruption of staff, systems and/or procedures caused by implementation
Increase in commission rate for travel agents	2.464	Degree of bureaucratic and regulatory commitment once the move is implemented
Feeder alliance with a commuter airline	3.078	The likely resistance from employees and/or unions to reversing the move
Merger and acquisition	4.528	Degree of support from external parties, e.g., investment banks and regulatory agencies, required for execution
Copromotion with nonairlines	2.016	Likelihood that the move will be publicly announced by top management
Increase in daily departures	2.869	Amount of industry publicity the move would receive
Exit from a route	2.249	Degree to which the move creates obligations to major stakeholders (e.g., suppliers and travel agents)
Entry into a route	2.791	Financial cost of reversing the move
Decrease in daily departures[b]	2.544	Extent to which relocation of staff and/or equipment would be required
Cooperation with another airline	3.078	Likelihood that top management approval would be required
Hub creation	3.934	Degree of interdepartmental coordination required for implementation
		Degree to which facilities other than aircraft used for this move could not be deployed for other purposes should the move be reversed

[a] Respondents rated each dimension on a five-point scale (1, very low; 5, very high) for each competitive move. The index is the average rating of a move across dimensions.

[b] Decrease in daily departures was dropped in the final analysis because of relatively low agreement between our initial classification and those of the industry executives and experts in the supplementary survey.

affiliation, management level, age, functional background, and education level. Overall, respondents had substantial experience in the industry; the average length of industry experience for respondents—excluding academics—is over 25 years. Table 2 profiles the respondents.

The questionnaire requested each respondent to rate on a five-point scale the effect of each of 13 moves along 14 dimensions of irreversibility (see Table 1), such as investment required, organizational disruption, and degree of industry publicity.[14] We constructed a composite irreversibility index for each move by averaging ratings on the 14 items. Table 1 reports index values. The reliability of the irreversibility index yielded a Cronbach alpha of .91, a highly acceptable value (Nunnally, 1978).

To assure the accuracy of the classification scheme further, we asked all respondents except the academics to complete a supplementary short questionnaire. The second survey asked respondents to classify the eight moves we considered to be most easily confused for each other. The questionnaire was completed by 106 experts, yielding a very high response rate of 66 percent; no nonresponse bias was detected. Results show a high level of agreement between the authors' classifications and those of industry executives and experts for seven types of move, with an average confirmation rate of 84 percent. For one move, decrease in daily departures, the agreement rate was a relatively low 65 percent, so we dropped it from analyses.

Likelihood of nonresponse was defined as the estimated probability that an action would not provoke retaliation from a given competitor. If a competitor was reported in *Aviation Daily* as reacting to an action, we identified it as an actual responder. Likelihood of nonresponse thus constitutes a dichotomous variable: 1 represents a competitor who could have responded but did not respond, and 0 represents response.

Response delay was defined as the length of time a responding competitor took to react to an action. It was measured as the number of days between the date a specific action was first reported in *Aviation Daily* and the date that journal first made public the competitor's response to the action.

Likelihood of a matching response was defined as the estimated probability that a responder would imitate an action. This measure was based on the concurrence of the types of an action and a response. If the response was of the same type as the action (for example, a price cut responding to a price cut), we identified it as a matching response.

Statistical Analysis

The 11 hypotheses relate four independent variables (competitor dependence, irreversibility of action, their interaction effect, and price) to three

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[14] We carefully selected 13 specific competitive moves reported in *Aviation Daily*, one from each generic type, through a series of pilot studies involving industry experts.

TABLE 2
Selected Characteristics of Survey Respondents[a]

Roles in Airline Industry	Average Years of Industry Experience	Percentage of Respondents
Senior vice presidents or above of major airlines[b]	25	25
CEOs or presidents of regional airlines[c]	24	19
CEOs or presidents of travel agencies[d]	27	12
Presidents and senior vice presidents of aircraft manufacturers[e]	28	3
Consultants[c]	32	20
Security analysts[f]	21	10
Senior managers, Federal Aviation Administration	15	2
Professors and researchers in competitive strategy[g]	not applicable	9
All industry respondents	26	100

[a] N = 176.

[b] Major airlines were those with annual operating revenues greater than $100 million.

[c] Airlines and consultants listed in the *World Aviation Directory* were used.

[d] These were the 65 top U.S. travel agencies in terms of revenues.

[e] Firms were Boeing and McDonnell Douglas.

[f] Analysts were those listed in the 1989 edition of *Nelson's Directory of Investment Research* and the October 1989 edition of *Institutional Investor*.

[g] Institutions were those the authors were affiliated with.

characteristics of response. Since the likelihood of nonresponse and the likelihood of a matching response are dichotomous variables, we performed logistic regression analysis, using ordinary least squares (OLS) multiple regression analysis to test the effects on response delay. All these regression equations take the general form of the following equation for likelihood of nonresponse:[15]

$$LN = a_0 + a_1X_1 + a_2X_2 + a_3X_1X_2 + a_4P + e, \qquad (1)$$

where

LN = likelihood of nonresponse,
X_1 = competitor dependence,

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[15] To reduce collinearity between the interaction term (competitor dependence by action irreversibility) and its component variables, we standardized all except the dependent variables before undertaking the numerical analysis. Table 5 reports the resulting reduction in multicollinearity. Although this process has no effect on the sign and significance of the interaction term, it did allow for a simultaneous examination of the main and interaction effects in the same equation. For details, see Southwood (1978), Gupta and Taylor (1990), and Neter, Wasserman, and Kunter (1990).

X_2 = action irreversibility,
X_1X_2 = the interaction term,
P = price actions,

and

e = the error term.

Significant values in the correct direction for the four regression coefficients a_1, a_2, a_3, and a_4 in Equation 1 would support Hypotheses 1a, 1b, 1c, and 4, respectively.

Table 3 summarizes the hypothesized relationships.

RESULTS

Table 4 gives means, standard deviations, and correlations for all variables used in the regression analyses.

Table 5 presents the regression coefficients and related statistics resulting from testing the hypotheses.

Likelihood of Nonresponse

As indicated in model 1 in Table 5, Hypothesis 1a was supported: the greater a defender's dependence on the markets affected by an action, the greater the likelihood that it will respond to the action. The result for action irreversibility was consistent with Hypothesis 1b: the more irreversible an action, the more likely that a defender will not respond. Findings also supported Hypothesis 4a: price moves are less likely to be immune from defenders' responses than are other moves. The result on the interaction effect was consistent with Hypothesis 1c; there is a significant, negative interaction between competitor dependence and action irreversibility.

The partial differentiation of model 1 with respect to competitor dependence offers further insight on the effect of the interaction of that variable and action irreversibility on the likelihood of nonresponse:

$$\partial(LN)/\partial(X_1) = -.51 - .19\,X_2. \tag{2}$$

TABLE 3
Summary of Expected Relationships

Independent Variables	Likelihood of Nonresponse	Response Delay	Likelihood of Matching Response
1. Competitor dependence	–	–	+
2. Action irreversibility	+	+	not applicable
3. Competitor dependence by action irreversibility	–	–	+
4. Price	–	–	+

TABLE 4
Means, Standard Deviations, and Correlations

	Affected Competitors[a]					Actual Responders[b]					
Variables	Means	s.d.	1	2	3	Means	s.d.	1	2	3	5
1. Competitor dependence	0.35	0.34				0.54	0.33				
2. Action irreversibility	2.64	0.49	−.12***			2.55	0.33	−.07			
3. Price	0.15	0.36	−.05***	.02**		0.46	0.50	−.28***	.29***		
4. Likelihood of nonresponse	0.99	0.11	−.02**	.03***	−.09***						
5. Response delay						14.13	24.27	.23***	.06	−.33***	
6. Likelihood of matching response						0.89	0.32	.15	.09	.27	−.06

[a] N = 17,069.
[b] N = 203.
* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 5
Results of Regression Analysis of Response Characteristics[a]

Variables	Likelihood of Nonresponse: Model 1	Response Delay: Model 2	Likelihood of Matching Response: Model 3	Response Irreversibility: Model 4
Competitor dependence	−0.51***	3.15*	0.82**	0.10*
	(0.07)	(1.70)	(0.28)	(0.04)
Action irreversibility	0.42***	7.32***	0.23	−0.06†
	(0.13)	(2.24)	(0.24)	(0.04)
Competitor dependence by action irreversibility	−0.19**	−4.34**	−0.41*	0.13**
	(0.09)	(1.92)	(0.20)	(0.05)
Price	−0.62***	−8.98***	1.27***	−0.13**
	(0.05)	(1.82)	(0.40)	(0.05)
Constant	4.82	14.16	2.74	2.64
	(0.10)	(1.61)	(0.38)	(0.04)
Adjusted R^2		.15		.56
F		9.64***		7.73***
χ^2	178.63***		32.35***	
N	17,069	203	203	23

[a] Standard errors are in parentheses.
† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

It can be calculated from Equation 2 that the value of $\partial(LN)/\partial(X_1)$ is 0 when $X_2 = -2.73$. Since we standardized all the independent variables prior to conducting the regression analysis, this finding implies that competitor dependence decreases the likelihood of nonresponse unless irreversibility is less than 2.73 standard deviations below its mean.

Figure 2 illustrates the implications of the partial derivative expressed by Equation 2. It plots the slope of the relation between competitor dependence and likelihood of nonresponse for different values of action irreversibility.

The moderating effect of irreversibility is demonstrated via Figure 2's three slopes, which vary with the changing values of irreversibility. Increasing competitor dependence sharply decreases the likelihood of nonresponse when irreversibility is high ($X_2 = 1$). The slope remains negative until irreversibility reaches the turning point ($X_2 = -2.73$), when increasing competitor dependence actually starts to increase the likelihood of nonresponse. However, under the assumption of normal distribution, 2.73 standard deviations below the mean is at the 99 percentile. So it is clear from this plot that likelihood of nonresponse increases with dependence only when irreversibility is very low; in general, the likelihood of nonresponse decreases with increasing dependence.[16]

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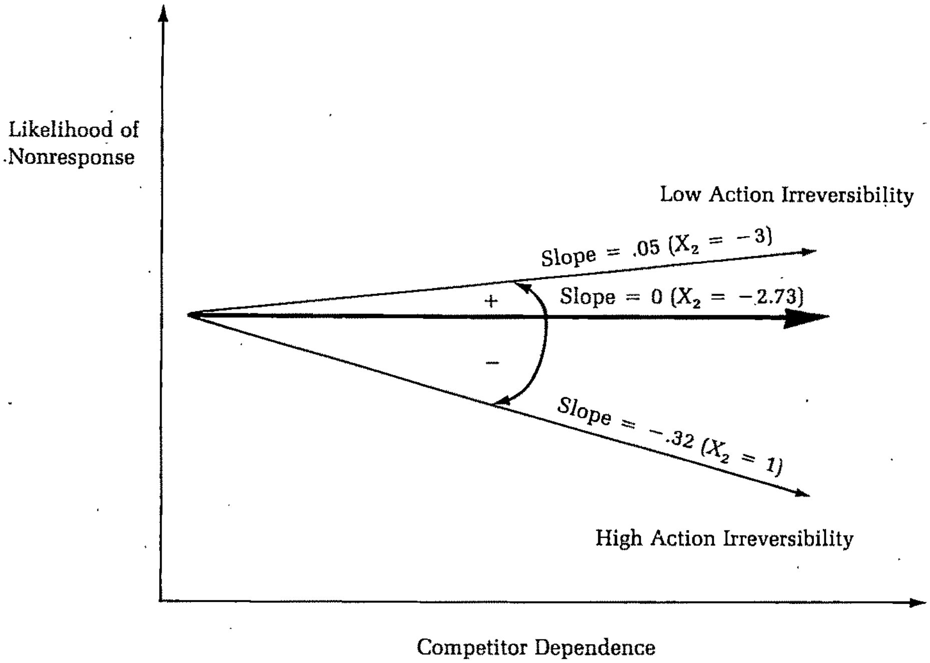
[16] Thus, though the interaction is statistically significant, for all intents and purposes it can be ignored in discussion of the results. This finding is also applicable to the results on the likelihood of a matching response.

FIGURE 2
Relationship Between Competitor Dependence and Likelihood of Nonresponse for Various Levels of Action Irreversibility



Response Delay

As the results for model 2 in Table 5 show, contrary to the prediction of Hypothesis 2a, the finding implies that when a defender's key markets are strongly threatened, retaliation tends to be slow. We examine this unexpected finding at length in the discussion section.

Hypothesis 2b was supported: the more irreversible an action, the longer a defender will take to respond. Hypothesis 4b was also supported: price moves are more likely than other moves to provoke speedy responses.

The result for the interaction effect supported Hypothesis 2c. The partial differentiation of model 2 with respect to competitor dependence offers further insight on this effect:

$$\partial(RD)/\partial(X_1) = 3.15 - 4.34\,X_2, \tag{3}$$

where

$$RD = \text{response delay.}$$

It can be calculated from Equation 3 that the value of $\partial(RD)/\partial(X_1)$ is 0 when $X_2 = 0.73$, which implies that competitor dependence decreases response delay unless action irreversibility is less than 0.73 standard deviations below its mean.

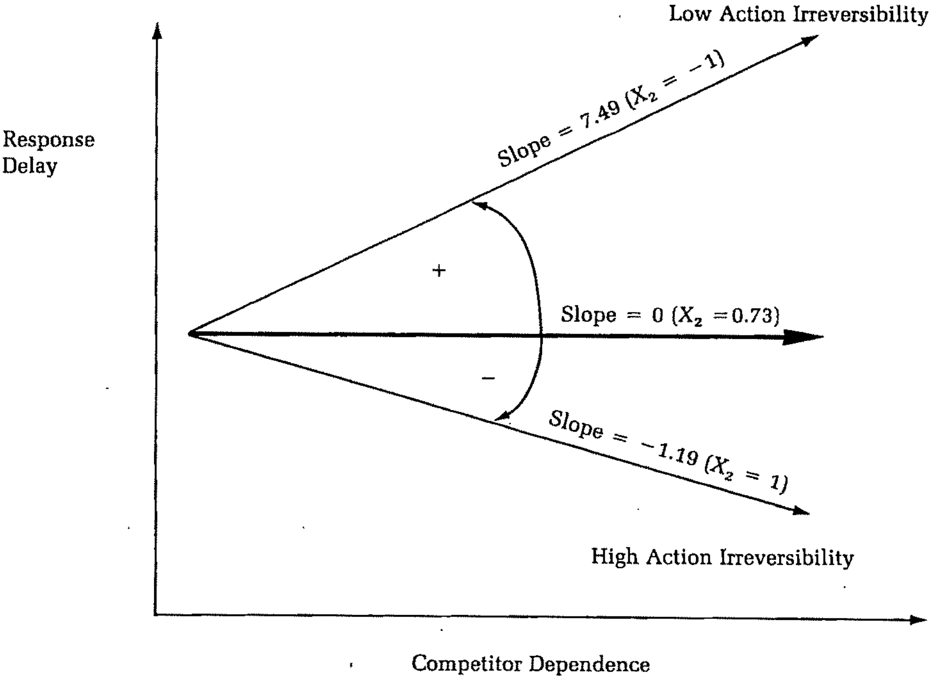
As Figure 3 shows, increasing competitor dependence increases response delay when action irreversibility is low ($X_2 = -1$). The slope remains positive until action irreversibility reaches the turning point ($X_2 = 0.73$), when response delay starts to decrease with increasing competitor dependence. The figure implies that for high values of irreversibility, response delay decreases with increasing dependence, whereas for moderately low irreversibility, response delay increases with dependence.

Likelihood of a Matching Response

As indicated in the results for model 3 in Table 5, Hypotheses 3a was supported: the greater a defender's dependence on the markets under attack, the greater the likelihood that it will directly match an initial action. The result for the price variable supported Hypothesis 4c: a price action has a greater likelihood than other types of actions of being countered by a matching response.

In addition, the finding for the interaction effect was significant, but

FIGURE 3
Relationship Between Competitor Dependence and Response Delay for Various Levels of Action Irreversibility



opposite to the prediction made in Hypothesis 3b. The partial differentiation of model 3 with respect to competitor dependence offers further insight on this effect:

$$\partial(LM)/\partial(X_1) = .82 - .41\ X_2, \tag{4}$$

where

LM = likelihood of a matching response.

Equation 4 suggests that the value of $\partial(LM)/\partial(X_1)$ is 0 when $X_2 = 2.00$, implying that competitor dependence would increase the likelihood of a matching response unless action irreversibility is more than 2.00 standard deviations above its mean; under this condition, competitor dependence would reduce the likelihood of a matching response.

As Figure 4 suggests, increasing competitor dependence increases the likelihood of a matching response when action irreversibility is low ($X_2 = -1$). The slope remains positive until competitor dependence reaches the turning point ($X_2 = 2.00$), when increasing competitor dependence starts to reduce the likelihood of a matching response. It is only at very high levels of action irreversibility that competitor dependence depresses the likelihood of matching. In general, increasing competitor dependence increases the likelihood of matching responses.

An additional analysis was conducted to explore nonmatching responses further—specifically, to see if we could predict their irreversibility. We performed a regression analysis using irreversibility of response as a dependent variable. The results, reported in model 4 in Table 5, suggest among other things that if a defender decides not to match an attacker's aggressive move, the greater its dependence on the markets under attack, the more irreversible its countermove will be. Table 6 indicates that all the relationships presented above would also exist for non–price actions only. In other words, findings still support the hypotheses even if price actions are removed from the data.

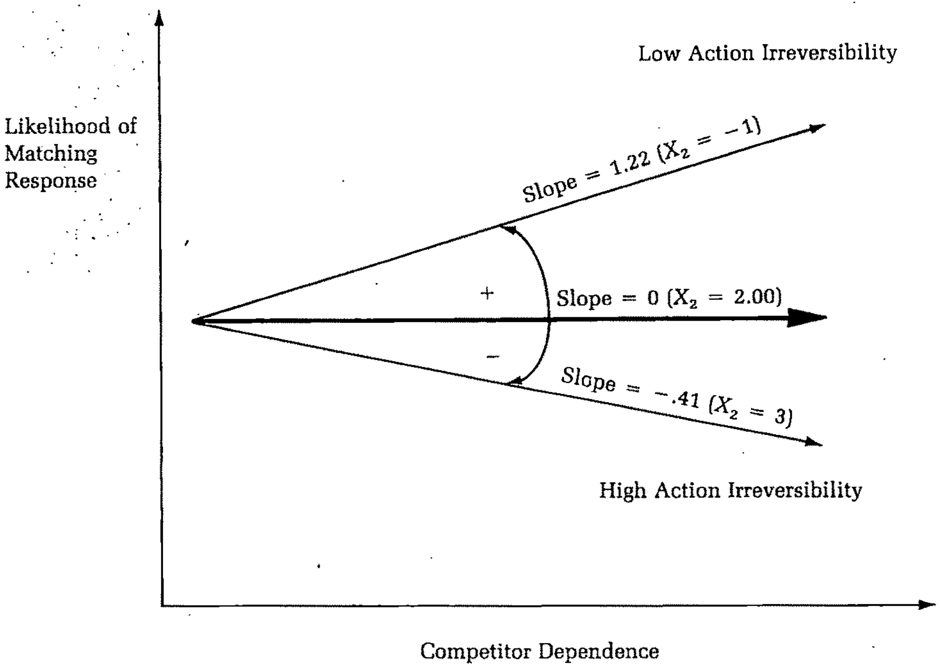
DISCUSSION

A principal purpose of this research was to identify variables strategy researchers can use to compensate for incompleteness of information when studying action-response dyads. Using a game theoretical framework, we developed the basic argument that in the absence of complete information about players' payoffs, competitor dependence and irreversibility are useful variables. Further, we have demonstrated empirically that these variables can be used to estimate the likelihood of nonresponse, response delay, and the likelihood of a matching response.

As expected, competitor dependence can act as a surrogate for estimating a defender's payoffs from an action. Consistent with the hypotheses, the stronger a defender's dependence on the markets affected by an action, the more likely it is both to respond and to match the initial action. These

FIGURE 4

Relationship Between Competitor Dependence and Likelihood of Matching Response for Various Levels of Action Irreversibility



findings are consistent with Tsai, MacMillan, and Low's (1991) conclusion that competitors who are highly dependent on a particular market react aggressively to the threat of new entry. It is also in line with Porter's (1980) and Dutton and Jackson's (1987) proposition that competitors are motivated to take quicker and stronger responses if they view an action as threatening.

As predicted, the more irreversible a competitive challenge, the more unlikely a defender is to respond; if the defender does retaliate, its response is likely to be delayed and to be nonescalatory. Thus, irreversibility may signal an aggressor's true type and its commitment to a course of action. These results to a large extent demonstrate the validity of Schelling's (1960) and Porter's (1980) conceptual discussions of the role of commitment in decision making in conflict situations; when high payoffs are at stake (competitor dependence is high), the degree of commitment signaled by an aggressor (action irreversibility) significantly shapes competitive moves and countermoves. This study thus empirically supports Porter's (1980) previously untested argument that such commitment can discourage and delay retaliation.

In general, competitor dependence appears to affect outcomes more than does the irreversibility of an action. However, the role of action irreversibility should not be underestimated: it not only affects two of the three

TABLE 6
Results of Regression Analysis of Response Characteristics for Non–Price Actions[a]

Variables	Likelihood of Nonresponse: Model 5	Response Delay: Model 6	Likelihood of Matching Response: Model 7	Response Irreversibility: Model 8
Competitor dependence	−0.70***	4.55†	1.09***	0.08*
	(0.10)	(3.01)	(0.31)	(0.04)
Action irreversibility	0.56***	7.63**	0.12	−0.07†
	(0.16)	(3.41)	(0.28)	(0.05)
Competitor dependence by action irreversibility	−0.28**	−5.29†	−0.51*	0.12**
	(0.10)	(3.41)	(0.27)	(0.05)
Constant	5.20	21.61	1.83	2.67
	(0.13)	(3.00)	(0.33)	(0.04)
Adjusted R^2		.04		.38
F		2.57*		5.01**
χ^2	69.45***		16.96***	
N	14,508	110	110	21

[a] Standard errors are in parentheses.
† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

outcome variables, but also is a contingency variable moderating the impact of dependence on such variables as response delay.

Price actions were shown to be especially provocative of all dimensions of response, thus demonstrating that they have special importance in provoking competitive retaliation, a commonly argued yet previously untested idea. Competitors are more likely to retaliate against price actions than against other actions, and they are likely to counter quickly and directly; presumably, the immediate impact price moves have on payoffs and the strong possibility of estimating these payoffs account for this pattern. The message from this finding is clear: avoid initiating a price move if you can use any other approach to attract customers. The airlines' recent emphasis on "frequent flyer" promotion, which is to a large extent a disguised and deferred price cut, provides a good example of such a strategy.

The research yielded some other interesting, and in some cases, unexpected, results. First, the proportion of nonresponses to the set of initial actions was surprisingly high; only 103 of 856 actions provoked at least one response. The theory section specifies some conditions under which a competitor, in anticipation of an attacker's further moves, may appear to capitulate. There are many other possible reasons: for instance, an action may go undetected, as might be the case with a confidential contract; be misperceived, as, perhaps, an internal change in operating procedures; or simply be considered unimportant—an example is the initial assumptions the International Business Machines Corporation and Digital Equipment Corporation made about network computing (Gannes, 1988). Of course, it may be that some proportion of responses went unobserved by the information source the study used, however comprehensive it may be.

As expected, action irreversibility is an important contingency variable that appears to moderate the impact of competitor dependence on key dimensions of response. When the unexpected results for response delay are examined in conjunction with other results, some especially interesting patterns emerge. Although there is an interaction effect between competitor dependence and action irreversibility for all dimensions of response, the moderating effect of action irreversibility occurs only in extreme cases of irreversibility for all response dimensions except response delay. Thus, for all practical purposes, the interaction effects on likelihood of nonresponse and likelihood of matching can be disregarded.

In the case of response delay, the main effect of competitor dependence was the opposite of what was expected. Instead of a negative effect on delay, dependence has a significant, positive main effect. If main and interaction effects are considered together, response delay rapidly decreases with increasing competitor dependence when the irreversibility of an action is moderately high. On the other hand, response delay rapidly increases with increasing competitor dependence when irreversibility is moderately low.

The unexpected result begs explanation. On reflection, the following explanation seems plausible: when attacked in their key markets, competitors in general tend to act with determination but also with deliberation and caution, for fear of precipitating escalation. Research on decision making has addressed the risk-averse propensity of decision makers in such large-stake situations (e.g., Bass, 1983), and risk aversion appears to play a role here. Recent findings in the strategy literature on American managers' general tendency to avoid taking high risks also echo this idea (Hitt, Hoskisson, & Harrison, 1991). It is also possible that competitors may have a desire to wait and see if an action really works or may be using a second-to-the-market strategy in order to minimize risk.

This risk-averse tendency manifests as follows: Facing attack in markets on which they have high dependence, defenders will react decisively, by responding rather than declining to react, thus signaling a willingness to protect their key markets and bolstering their reputations for doing so. If the action launched by an attacker has low irreversibility (and thereby signals lack of commitment), defenders will delay their reaction in order to develop a countermove, not necessarily a matching one, but one that will discourage further incursions.

On the other hand, if an attacker makes a highly irreversible, and therefore highly threatening, move against one of a defender's key markets, the defender is obliged to act both decisively and swiftly, to signal toughness and to defend its reputation, so that the likelihood of both nonresponse and response delay is low. As both Axelrod (1984) and Schelling (1960) argued, it is important to react fast because the power of a signal fades with time. To avoid escalation, however, the defender will also tend to match the attacker's move, signaling a willingness to defend its position but not to escalate.

The results have thus empirically demonstrated the importance of matching moves as a signaling device (Schelling, 1960); when stakes are high, there is a propensity to match, signaling a willingness to play tough while avoiding escalation. These findings also support the theoretical arguments of Schelling and of Axelrod that the timing of retaliation serves as an important signal in competitive exchange.

Naturally, the question arises of how competitive exchange affects performance. We collected market share data to investigate the performance implications of moves and countermoves. In actual competition, the outcomes of a move and countermove occur in an *n*-person context—in other words, every move involves many airlines, not just a single rival. Therefore, it seems likely that any move that does not provoke responses from every airline will result in market share gains for its initiator. Furthermore, any response not accompanied by responses from all other affected airlines will result in market share gain at the expense of slower responders or nonresponders. Thus, all initiators and quick responders in a contest are likely to benefit at the expense of slow responders and nonresponders. It therefore seemed likely that the following market share changes would occur following aggressive actions and responses: (1) attackers will gain share, (2) responders will gain share at the expense of nonresponders, (3) attackers will gain more share than responders, and (4) early responders will gain more share than late responders.

To test the above expectations, we obtained monthly data on passenger shares for airlines making competitive moves. Increases and decreases in share for each attacking and responding airline were calculated as a percentage of total passengers. We then measured these percentages at three points in time: the end of the month in which a move was made, reflecting market share change from the previous month; one month after the move was made; and two months after the move was made. These time periods are represented in Table 7 as the one-, two-, and three-month lags.

As Table 7 indicates, the average market shares gained by attackers are

TABLE 7
Monthly Market Share Changes[a]

	Attacker		Defender	
Intervals	**Means**	**Standard Deviations**	**Means**	**Standard Deviations**
One-month lag	.05**	.03	.04	.04
Two-month lag	.20**	.06	.09	.06
Three-month lag	.27**	.07	.09	.10

[a] Mean percentages are shown; Ns = 856 for attackers and 203 for defenders.

* $p < .05$

** $p < .01$

all positive and significantly greater than zero for all three time periods. For responders, the average market shares gained are also all positive, although they are not statistically significant. (However, the medians for market share changes are all significantly greater than zero for all three time periods.) The results of a mean difference test contrasting attackers and responders are as follows: one-month lag, $t = .24$, n.s.; two-month lag, $t = 1.36$, $p < .10$; and three-month lag, $t = 1.59$, $p < .05$. The correlations between response delay and responders' market share changes are as follows: one-month lag, $r = -.11$, $p < .10$; two-month lag, $r = -.08$, n.s.; and three-month lag, $r = -.02$, n.s. Although results are not all statistically significant, the signs are in the expected direction for all three periods.

In every case, then, the expectations were generally supported for all three time periods measured. The findings indicate that both attackers and responders gain share at the expense of nonresponders. Responders, however, gain less share than attackers, and quick responders tend to gain more share than slow responders.

Limitations

An important question is, To what extent can these results be generalized? The U.S. domestic airline industry possesses some idiosyncratic features that, on the one hand, made it an ideal setting for testing the proposed theory, but, on the other hand, can affect the generalizability of the research findings. For instance, competitive information is readily available through the unusually comprehensive industry publication *Aviation Daily*, through the powerful and pervasive computerized reservation systems, and through the airlines' consistent reporting of operating information (a carryover from the regulation era). The airline industry has been undergoing a significant change as a result of deregulation; competitive actions, especially price moves, may thus be followed very intently, since no companies want to be left behind in this new game. Although these industry features might have implications for the generalizability of the study, similar features could also be found in such industries as banking, consumer products (e.g., soft drinks), and car rental.

The kind of competitive moves identified, the significance of irreversibility and competitor dependence to competitive exchange, and the selection of important characteristics of responses for study may also vary across industries. For example, the high incidence of matching responses in the data could be a result of the effects of recent deregulation. The very detailed and comprehensive reporting by *Aviation Daily* could also have increased the visibility of competitive actions.

The competitive impacts of the actions studied were very clear because the industry's statistics are comprehensive, so the number of each competitor's passengers affected by an action can easily be assessed. Another interesting issue worth exploration is the role that the clarity of competitor dependence plays in predicting responses. It would be interesting to undertake a study in an industry in which competitor dependence has less clarity.

In spite of these special features of the airline industry, the theory and methods of this study should be applicable to research on other industries. Specifically, the sampling of the action-response pairs to capture firm rivalry and the method of linking responses to their initial actions should be generalizable to studies of competitive exchange across a variety of industries.

Implications

Future research can make several extensions of the present research. First, the study should be replicated in other settings—different industries in the same time frame or different time frames in the same industry—to test the theory and the findings further.

Second, irreversibility has multiple sources—economic, institutional, organizational, psychological, and political ones. Here, we used irreversibility as an aggregated construct. Once the general relationships between irreversibility and other important variables in competitive exchange are outlined, it would be valuable to investigate further different types of irreversibility and their effect on competitive responses.

Third, researchers seem to have underestimated the significance of price actions for understanding competitive exchange, as a result of their apparently tactical nature. Price actions are by no means homogeneous: they involve increases as well as decreases, and they vary in magnitude. Thus, the competitive implications of major price moves should be analyzed explicitly. In addition, objective information is usually more available for price moves than it is for other types of moves, which should make it possible to examine the directionality and magnitude of effect of competitive moves on responses, another unexplored yet important issue in strategy.

Fourth, competitive interaction constitutes a very complex and dynamic process in which actions trigger strings of responses and counterresponses. Instead of regressing into infinite iteration, this study focused only on the first iteration of an action-response dyad. This focus provides a starting point for studying competitive interaction; nonetheless, future studies should attempt to develop a more extensive, multistage framework.

Fifth, to examine theories proposed by Porter (1980), Axelrod (1984), Rasmusen (1990), and Smith and colleagues (1991), and to extend the results of performance effects demonstrated in Table 7, further studies of performance should be carried out. We kept our focus at the action-response level in order to explore fully the phenomenon of competition at a micro level. Although reliable performance data at this level of analysis are very difficult to obtain, future research may be able to aggregate strings of actions and responses, either within the multistage framework proposed above or at the organizational level. As understanding of competitive exchange grows, it will be important to analyze further the performance effects that result from action-response dynamics.

Finally, this study has demonstrated that competitor dependence and irreversibility are major forces in explaining lack of competitive retaliation. However, the somewhat unexpectedly high incidence of nonresponses in the data may call into question the emphasis on competitive dynamics per se. Thus, it appears that more serious attention should be paid to the resource-based view of firms (Barney, 1986, 1989; Dierickx & Cool, 1989; Wernerfelt, 1984), according to which, firm attributes, often idiosyncratic and thus nonimitable, may impede competitive responses. This study focused on the basic building block of the action-response dyad. It focused specifically on characteristics of the market segments under attack and the attacking moves made. We did not look at the specific internal attributes of the firms making moves and how those attributes might shape the initial selection of a move or of the market to attack. Future study investigating such firm-specific attributes as an attacker's reputation, product-market selection, and motive for attack should add significantly to this line of research.

These findings should also be valuable to practicing strategists. For example, a key question for an attacker is whether an action will deter or discourage retaliation. By attacking markets that rivals do not prize highly, a strategist may be able to preclude retaliation long enough to gain a valuable foothold. Thus, tactics based on forays into neglected or hitherto unprized territory may have their rewards. Similarly, the irreversibility of a competitive move has important implications for likely responses, a phenomenon managers should take into account.

In summary, the present study adds to an underresearched yet important area in strategic management. The focus on action-response dyads in competitive interaction provides preliminary evidence that the nature of an action, its impact on competitors, and its irreversibility are significant predictors of response and response delay. The analysis of actual competitive interaction demonstrates the action-response level as basic for understanding the dynamics of competitive behavior and opens the way for further studies of more complex competitive interaction.

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COMPENSATION SYSTEM ATTRIBUTES AND APPLICANT POOL CHARACTERISTICS

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The relationships between two compensation system attributes—pay level and the level and flexibility of benefits—and the number of applicants attracted to a job, the rate at which they accept the job, and the length of time it takes a firm to fill positions were examined using data on the process of hiring tellers from 352 U.S. banks. Pay level was positively related to acceptance rate as hypothesized, but was unrelated to the number of teller applicants. Opposite to prediction, pay level was positively related to the length of time it took banks to fill teller positions. Benefits were not related to acceptance rate; however, some aspects of benefit programs were positively related to both number of applicants and the time it took to fill positions, and some were negatively related. The study of relationships between human resource practices and firm performance and the implications of the findings for compensation strategy and practice are discussed.

Research devoted to human resources management is undergoing a transition from the traditional individual-oriented research paradigm to one that places human resources management in a broader context. Traditionally this research has focused on the design and evaluation of a behavioral technology that can be applied to individuals in work settings. Industrial-organizational psychology and social psychology serve as the primary research paradigms for human resources management scholars taking this perspective; according to Roberts, Hulin, and Rousseau (1978), the traditional approach has been to explain and predict a particular class of individual responses by relying on independent variables that also are measured at the level of the individual. More recently, organizational scholars have argued that theory and research that places human resources management in a broader context will lead to a more rapid advancement of the science of organizations (e.g., Butler, Ferris, & Napier, 1991; Dyer, 1980, 1984, 1985; Milkovich, 1988; Wallace, 1983; Zedeck & Cascio, 1984). These scholars have often advocated

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studying human resources management systems and how system variation relates to intermediate outcomes and ultimately to firm performance. Thus, in this view, the effects of human resources management practices on organization-level variables such as productivity and profitability become the central area of attention. At the very least, it can be argued that the organization-level perspective complements the more traditional approach and, taken together, the two perspectives contribute to the integration of theory and research and advance knowledge of human resources management.

One aspect of overall human resources management systems presumed to have a profound impact on organizational functioning is compensation systems. Wages and salaries alone make up approximately 49 percent of the total value of goods and services produced in the United States (U.S. Department of Commerce, 1990: 12–13.). If the estimated $742 billion spent each year on another aspect of compensation—employee benefits (U.S. Chamber of Commerce, 1986: 24)—is added to that figure, it appears that research investigating the consequences to firms of changing aspects of their compensation systems is of great importance.

Despite the perceived importance of pay policies and practices, very little empirical research has examined the links between these practices and organizational outcomes (Milkovich & Newman, 1990). In fact, Ehrenberg and Milkovich (1987) concluded that "considering the resources devoted to employee compensation and its management, we do not even know if the overall pay strategies adopted make any difference. That is, we simply do not know whether managing compensation pays off" (1987: 113). Ehrenberg and Milkovich (1987) suggested that part of the reason for this lack of empirical evidence is the difficulty of conducting this type of research, and they concluded that researchers studying compensation and firm performance relationships need to expand the range of dependent variables that has been used. Suggesting an alternative to financial and stock market measures of organizational performance, Ehrenberg and Milkovich proposed that researchers focus on the establishment or business-unit level to estimate the effects of compensation policies on intermediate outcomes—the outcomes that compensation practices are designed to directly influence, such as applicant attraction, turnover, and group and business-unit performance.

The present study contributes to the emerging organization-level perspective by investigating the relationships between attributes of firms' compensation systems and three key intermediate outcomes presumed to be related to firm performance: the size of an applicant pool, the acceptance rate, or rate at which applicants accept jobs, and the length of time it takes firms to fill positions. Pay level and the level and flexibility of benefits provided by a firm served as the primary independent variables of interest. Also, this study portrays the methodological complexity associated with studying the effects of one aspect of human resources management systems within the context of other system components and provides insights into how the various components of human resources management systems are interrelated.

PAY LEVEL, BENEFITS, AND INTERMEDIATE OUTCOMES

Size of Applicant Pool

A large applicant pool is thought to be an advantage because, if the number of positions to be filled is held constant, it provides an organization with a large number of applicants to select from, allowing those doing the hiring to be more selective than they could be otherwise. The advantages to the productivity of a firm's labor force of lowering the selection ratio for a job have been apparent for more than half a century (Taylor & Russell, 1939); and more recently, Boudreau and Rynes (1985) expanded Boudreau's (1983) "employee flows" utility model to include the importance of variation in applicant pool size for determining the utility of a staffing procedure.

Research conducted within both the public sector and the military has indicated that pay level is indeed related to applicant queue. Krueger (1988) demonstrated that the ratio of federal to private sector earnings had an economically sizable and statistically significant effect on the number of applications received per federal worker hired. In addition, Brown's (1985) study of the military found that civilian wages were negatively related to the number of voluntary military enlistments. Although these studies provide evidence for the impact of wages on the sizes of applicant pools, the research has been focused on the effects of pay on large, highly visible governmental employers and provides little information about effects at a firm or establishment level in smaller organizations or private industry. The present study is the first to examine these relationships within the private sector.

In addition to the studies cited above that have examined organization-level outcomes, numerous laboratory studies have considered the attractiveness of wage levels to individual job applicants. These laboratory studies provide indirect support for a positive relationship between pay level and the size of an applicant pool. High pay levels have been associated with higher ratings of the attractiveness of a job and an organization as well as with intentions to request additional information about a company, sign up for an interview, and accept a second interview invitation (e.g., Rynes & Miller, 1983; Schwoerer & Rosen, 1989). Therefore,

> *Hypothesis 1: Pay level will be positively related to the number of applicants attracted to an organization.*

The effects of benefits, the second set of predictors studied, on intermediate outcomes and bottom-line profitability have been largely neglected in benefits research. In general, the research that has been conducted on employee benefits has indicated that employees are not aware of or undervalue the benefits provided by their employers (e.g., Halley & Ingram, 1973; Huseman, Hatfield, & Robinson, 1978; Wilson, Northcraft, & Neale, 1985). However, several recent trends, including the increasing number of women in the labor force, the increasing number of dual-career families, the recent sharp rise in medical costs, and the proliferation of flexible benefits programs seem to indicate a renewed interest among employees in their benefits packages.

In other words, employees are beginning to recognize the value of their benefits, and therefore we might expect benefits to play a role in determining the size of a firm's applicant pool by affecting individuals' decisions to apply.

With respect to benefits, the only intermediate outcome that has received research attention is the size of an applicant pool, and findings have been contradictory. First, Brown (1985) found that educational benefits had a much larger effect on the number of military enlistments than the military wage did. In addition, Tannen (1987) demonstrated that an increase in the educational benefits offered to recruits was associated with a dramatic increase in the number of high-quality Army enlistments. Thus, benefits can have an effect on intermediate outcomes, especially under conditions in which benefits are highly visible. Alternatively, Krueger (1988) found that an increase in the level of benefits in the federal government relative to those in the private sector had no significant effect on the federal job application rate. Krueger suggested that this finding might be the result of using an imprecise measure of the value of employee benefits. In addition to being the first to examine benefit–applicant pool relationships within the private sector, we used more precise measures of the level of benefits provided than have been used previously, in the hopes of perhaps uncovering a relationship that Krueger was unable to detect. In addition, the flexibility allowed employees in choosing their benefits was examined. Although it would be desirable to state the hypotheses concerning benefits and applicant pool characteristics in more detail, there is insufficient research upon which to base more specific hypotheses. Thus, we measured several important dimensions of benefits so the effects of various components of benefit packages could be examined. In general, we hypothesized that high coverage levels (in the form of additional paid days off, for instance) and benefit flexibility—for instance, providing employees with the opportunity to select options of particular personal value—will give employees more of what they want and increase the expected return associated with a prospective employer. However, additional costs in the form of payroll deductions should lower the expected return and negatively affect recruitment outcomes. Therefore, in view of the findings of Brown (1985) and Tannen (1987),

> *Hypothesis 2: The level and flexibility of benefits provided will be positively related to the number of applicants attracted.*

Acceptance Rate

A second intermediate outcome that can also have an impact on the productivity of a firm's work force is the acceptance rate, or the number of offers an employer makes that are actually accepted by applicants. Murphy (1986) demonstrated that the productivity of a firm's work force depends upon the firm's using accurate job-related predictors of performance, setting high selection standards, and generating a high acceptance rate. If any of these three components suffers, the productivity of the resulting work force suffers as well. Despite Murphy's demonstration of the importance of acceptance rate in determining utility, no empirical research has focused on relationships between compensation system characteristics and actual acceptance rates. However, the laboratory research on job attributes cited in the section on pay level and number of applicants has indicated that a high pay level might affect the productivity of a work force by increasing a firm's acceptance rate. Therefore,

> *Hypothesis 3: Pay level will be positively related to acceptance rate.*

No empirical research has examined the relationship between the benefits a firm provides and its acceptance rate. Despite the research that has shown that employees tend to undervalue the benefits provided by their employers, the recent trends described above (in support of Hypothesis 2) do indicate a renewed interest among employees in their benefits packages. Therefore, we expected benefits to play a role in job acceptance. Thus,

> *Hypothesis 4: Benefit level and flexibility will be positively related to acceptance rate.*

Length of Time to Fill Positions

Finally, the third intermediate outcome investigated here is the length of time it takes firms to fill their positions. When the number of applicants is less than or equal to the number of positions to be filled, or a large percentage of applicants are underqualified, an organization may be forced to leave some positions unfilled rather than hire marginally acceptable or unacceptable applicants. In extreme cases, organizations may be forced to leave positions unfilled indefinitely. The effect on firm performance of taking a long time to fill positions would be lost productivity and poorer customer service because of understaffing. This intermediate outcome seems particularly important in light of the labor shortages that firms are currently experiencing, especially in the service sector, and projections indicating that labor shortages will exist into the next century (Johnston & Packer, 1987). Despite these concerns, no empirical research has examined the relationship between any compensation variable and this intermediate outcome. If pay and benefits are likely to play a role in determining the attractiveness of a job to an applicant,

> *Hypothesis 5: Pay level and the length of time it takes to fill positions will be negatively related.*
>
> *Hypothesis 6: The level and form of benefits will be negatively related to the length of time it takes to fill positions.*

METHODS

Data

Rynes and Boudreau (1986) suggested that, because data collection and analysis across occupational groups is complex, the study of human resources management practices across organizations is best accomplished within a narrow occupational category. We chose to study banking, specifically, the job class of bank teller, for several reasons. First, an adequately sized population of organizations was potentially obtainable. Second, it was necessary to choose a focal job class in which a substantial amount of turnover occurs, and tellers occupy such a job class. An additional benefit of this choice was that few banks are unionized. Since unionization is a variable that plays a role in determining compensation practices (Freeman & Medoff, 1984), selecting a population in which unionization does not vary provides additional control.

The initial population consisted of all commercial banks listed in the *Rand McNally Bankers Directory* (Rand McNally, 1988) and located in U.S. cities with populations greater than 200,000; there were 1,061 such banks. We chose this strategy to ensure that employees within the relevant labor markets of these banks would not be limited to one or two financial institutions for employment. Questionnaires were sent to the human resources management director of each bank during the fall of 1988. We asked directors to base responses on their most recently completed fiscal year.

Survey Content

Control variables. We included five variables in analyses to control for bank characteristics and local economic conditions (see the Appendix for more complete descriptions). All of these variables were included because of their potential effects on both compensation levels and applicant pool characteristics. Organizational size (as measured by total assets) and net income were used because they tend to be associated with wage levels (e.g., Mellow, 1982) and because both may be related to the dependent variables, particularly the number of applicants attracted and the length of time positions remain open. We assessed the general labor market conditions within each city using unemployment rates. The number of tellers hired was included as a control variable only in the equation for the number of teller applicants. The number of teller applicants can provide no indication of selectivity in hiring tellers unless the number of tellers hired is taken into account.

Because not all banks from each city responded, it was necessary to obtain an independent assessment of the mean level of pay for bank tellers within each city. This measure controlled not only for variations in pay based upon an area's cost of living ($5.00 per hour is a higher wage in Louisville, Kentucky, than it is in Boston), but also provided a benchmark to which each bank's absolute pay level could be compared. For example, if 10 of the 20 banks in a particular city returned surveys, it was possible that the 10 respondents were not a random sample of the 20 banks in that city with respect to pay and that the mean level of pay for those 10 banks was higher or lower than it would be for all 20 banks. Thus, the bank with the lowest level of pay among the 10 respondents may still be paying at or near the mean for all 20 banks in the city, a situation that would bias the results of the regression analyses. The mean hourly wage for Accounting Clerk Level II was available for 51 of the 67 cities (U.S. Department of Labor, 1988) and was used as the benchmark. This provided the opportunity to examine the effects of pay relative to a standard wage rate within each city.

Other human resource practices. Numerous researchers (e.g., Schuler, 1987; Steffy & Maurer, 1988) have suggested that the interaction of all human resources management practices should be studied when researchers consider human resources management activities at a firm level. In order to capture this systems perspective, we measured three other human resources management practices (see the Appendix). First, because there are reasons to expect that recruitment practices will be related to pay level as well as to intermediate outcomes (Rees & Schultz, 1970; Rynes & Barber, 1990), the effort devoted to and the emphasis placed upon recruitment were assessed. We obtained a list of all of the recruitment practices used by each bank and classified each recruitment method as either a relatively expensive or inexpensive method; these judgments were based upon cost estimates provided by respondents. Referrals from current employees (if no monetary incentive was provided), referrals from other employees, help-wanted signs, public employment services, walk-ins, and job posting were considered to be inexpensive methods. Monetary incentives for referrals from current employees, private employment agencies, and newspaper advertising were considered expensive methods. We then created an index of the degree to which a bank relied on expensive methods of recruitment based upon the number of such methods used.

Two additional aspects of human resources management activities were measured: training and development, and advancement opportunities. It is possible that training opportunities or the possibility of rapid advancement might attract an individual to an organization, rather than (or in addition to) an attractive compensation package. Further, training and advancement opportunities may vary with pay level (Barron, Bishop, & Dunkelberg, 1985).

Compensation practices. Ehrenberg and Milkovich (1987) suggested that research on compensation and firm performance should examine a firm's policies on the various dimensions of compensation simultaneously rather than focusing on one policy to the exclusion of others. Following this suggestion, we assessed four dimensions of compensation practice: the form, or mix, of compensation; policies for granting pay increases; pay level; and benefits (see the Appendix for variable definitions). Form or mix and policies for granting increases served as controls in this study. Benefits were measured by six variables designed to capture both the level of benefits provided and their flexibility—the degree to which they are tailored to employees' needs. Several of these variables were based upon Dreher, Ash, and Bretz's (1988) measurement of benefit coverage in law enforcement agencies. Additional data described in the next section were available to provide interrater reliability estimates for benefit flexibility. The correlation between 60 sets of ratings of benefit flexibility provided by independent raters was .77. The mean difference between the two sets of raters was not significant.

Applicant pool characteristics. Three dependent variables were measured. The first was the number of teller applicants that each bank attracted during the fiscal year studied. Second, we assessed the percentage of employment offers made to tellers that were accepted during the year by asking the average number of offers made for each bank teller position filled. Finally, we asked each bank the average number of days that a teller position remained open before it was filled. Reliability estimates for these dependent variables were not available from the present data or from past research; however, we later sent two additional questionnaires, one similar to the questionnaire described herein and one condensed, to the respondents of the initial survey. The human resources management directors were asked to refer the shorter questionnaire to someone in the bank who was familiar with the human resources management practices of the bank. That person was asked to complete the shorter questionnaire and return it in an enclosed envelope.

Sixty pairs of usable supplemental questionnaires were returned. The correlations between the primary and secondary groups of respondents for each of the dependent variables were as follows: teller applicants, .94; acceptance rate, .69; and days position open, .64. In addition, there were no mean differences between the primary and secondary respondents. Although these results do not provide direct evidence of the precision of the original data, they do provide evidence of interrater reliability for the same variables collected in the same fashion from the same banks that participated in the original survey.

RESULTS

Respondents and Preliminary Analyses

Questionnaires were sent to banks in 67 cities and 31 states (1,061 questionnaires). A total of 352 usable questionnaires were returned, yielding a response rate of 33.2 percent. We compared respondent banks with nonrespondents on eight different variables. First, chi-square goodness-of-fit tests indicated that the geographical distribution of the respondents did not differ significantly from what would be expected given the distribution of the population of banks. Table 1 shows comparisons on the remaining seven variables. There were no significant differences between the respondents and nonrespondents based upon local unemployment rates and housing costs. These findings indicate that results from this study are not limited to specific geographical locations or labor market conditions.

Respondents were also compared with nonrespondents on five characteristics of the banks themselves: total assets, net income, productivity (in-

TABLE 1
Comparison of Respondent and Nonrespondent Banks[a]

Variables	Means: Respondents	Means: Nonrespondents	F	p
Unemployment rate	5.96	6.03	0.37	.56
Housing cost	124.82	130.83	2.04	.15
Total assets[b]	959,202.89	778,475.55	6.23	.01
Net income	2,446.99	905.17	1.12	.29
Productivity	−0.003	−0.005	0.74	.39
Number of branches[b]	14.95	10.80	10.34	.00
Part of a holding company?[c]	1.67	1.59	5.89	.01

[a] For respondents, $N = 352$; for nonrespondents, $N = 707$.

[b] The logarithms of these variables were used in the F-test because the variables were not normally distributed.

[c] No = 1, yes = 2.

come divided by assets for 1987), the number of branches operated by a bank, and whether or not a bank was part of a multibank holding company. There were no significant differences based upon net income or productivity. Respondents differed significantly from nonrespondents on total assets, number of branches, and belonging to a holding company; all are variables related to bank size. A bank that had high total assets, that operated many branches, or that was part of a holding company was more likely to respond to this survey than were other banks. A possible explanation is that large banks are likely to have large human resources management staffs whose members might be more able and willing than the human resources employees of a small bank to respond to a lengthy survey concerning these practices. In addition, the possibility exists that banks that operate many branches, or belong to a holding company, or both might have better-developed human resources management practices since they are required to staff multiple locations, and again might be more likely to respond when asked to describe these practices. Although some significant differences do exist between respondent and nonrespondent banks, all of these differences tend to be related to size. We mention implications of this difference in the discussion section. Table 2 shows characteristics of respondent banks and their tellers.[1]

Distribution of variables. We examined the skewness and kurtosis of each variable to determine whether a transformation should be considered prior to statistical analyses (Kendall & Stuart, 1977). Following accepted practice for measures of organizational size, we logarithmically transformed total assets. Two of the three dependent variables had values for skewness,

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[1] We also conducted the regression analyses excluding the 17.4 percent of respondents that indicated that the job description in the survey was a "slight" or "moderate" fit to the job of teller within their bank. The results were no different from those presented in Table 5.

TABLE 2
Characteristics of the Banks Studied

Characteristics	Percentages	Means	s.d.
Fit of teller job within bank to job described in questionnaire			
Slight	0.9		
Moderate	16.5		
Considerable	63.4		
Identical	18.8		
Teller gender			
Men	11.9		
Women	88.1		
Teller age			
Less than 25 years old	42.9		
26 to 40 years old	42.7		
41 to 55 years old	11.9		
Over 55	2.3		
Teller educational attainment			
Less than high school	0.4		
High school degree	62.1		
Some college	29.3		
College degree	7.9		
Average teller tenure, years		3.2	2.2
Average number of tellers, 1988		54.3	163.5
Average full-time equivalents, 1988		568.4	1,531.5
Percentage teller turnover, 1987		32.9	29.1
Percentage part-time tellers		21.1	20.4

kurtosis, or both that exceeded the acceptable ranges. Logarithmic transformations of the number of applicants and the number of days a teller position remained open before it was filled reduced the values of skewness and kurtosis to within the acceptable range. Following accepted practice for the use of a proportional dependent variable, we made an arcsine transformation of acceptance rate (Tabachnick & Fidell, 1989).

Correlations. Table 3 shows the correlations among a subset of the predictor variables. The correlations among the control variables (variables 1–5) were as expected, and they seemed to capture the overall health of the local economies studied. Except for a modest positive correlation between recruitment and opportunities for advancement, the human resources management–practice variables of recruitment, training, and advancement (variables 6–8) were not significantly related to each other. However, these variables were positively related to a number of compensation system variables (variables 9–14). Table 4 shows the mean and standard deviation for each variable and the correlations between the predictors and the independent variables. As shown at the bottom of Table 4, the dependent variables themselves are not highly correlated with each other.

TABLE 3
Means, Standard Deviations, and Correlations[a]

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Total assets[b]													
2. Net income	.37***												
3. Unemployment	−.13**	−.21***											
4. Benchmark wage	.06	−.06	−.17**										
5. Number of tellers hired	.42***	.40***	−.16**	−.07									
6. Recruitment	.27***	.15**	−.26***	.25***	.15**								
7. Hours of training	.38***	.18***	−.09*	−.07	.21***	.03							
8. Advancement	.09*	.01	−.16**	.17**	.06	.09*	.00						
9. Average percentage raise	.03	.07	−.20***	.04	.09*	.07	.13**	.18***					
10. Benefit percentage	.44***	.04	−.12*	.10	.13*	.12*	.19**	.11*	.16**				
11. Benefit flexibility	.38***	.14**	.01	.01	.26***	.17**	.17**	.11*	.01	.09			
12. Paid days off	.24***	.03	.08	.20**	.09*	.13**	−.02	.08	.04	.18**	.03		
13. Minimum pay	.15**	.03	−.19***	.38***	.00	.28***	−.04	.10*	.04	−.02	.01	.10	
14. Midpoint of pay range	.22***	.09*	−.14**	.36***	.05	.27***	−.02	.09*	.01	.01	.07	.17**	.79***

[a] N = 241–352. Because of space limitations, predictor variables were excluded from this table if they were not significant in any of the regression equations.

[b] This variable was a logarithm.

* $p < .05$

** $p < .01$

*** $p < .001$

TABLE 4
Means, Standard Deviations, and Correlations Between Independent and Dependent Variables^{a}

Variables	Means	s.d.	Teller Applicants^{b}	Acceptance Rate^{c}	Days Position Open^{b}
Independent					
Total assets^{b}	5.14	0.86	.53***	.06	.25***
Net income	3,513.14	18,241.23	.29***	.01	.19***
Unemployment	5.97	1.68	−.15**	.08	−.18***
Benchmark wage	7.59	0.61	−.13*	−.05	.11*
Number of tellers hired	36.23	108.97	.54***	−.08	.14**
Recruitment	1.24	0.76	.11*	−.03	.22***
Hours of training	94.84	70.38	.26***	−.02	.19***
Advancement	57.23	32.80	.11*	−.05	.17**
Long-term incentives	0.22	0.41	.10*	.09*	−.03
Short-term incentives	1.23	0.42	.14**	.01	.05
Bonuses	0.20	0.40	.10*	−.08	.03
Base pay adjustments	0.11	0.31	.00	.00	−.04
Average percentage raise	4.70	2.24	−.01	−.14**	.19***
Basis of raise	4.53	0.75	.11*	.17**	.14**
Benefit percentage	23.36	9.11	.33***	.00	.11*
Benefit flexibility	0.68	1.12	.14**	−.02	−.01
Paid days off	27.50	4.64	.13*	.07	−.01
Retirement plan	0.65	0.48	.24***	.11*	.13**
Medical coverage	0.00	1.00	−.03	.03	−.02
Medical cost	0.00	1.00	.09	.07	−.07
Minimum pay	5.40	0.84	−.06	.06	.22***
Midpoint of the pay range	6.90	1.00	−.03	.12*	.12*
Dependent					
Teller applicants^{b}	1.80	0.69		−.03	.23***
Acceptance rate^{c}	1.25	0.47			−.12*
Days position open^{b}	1.15	0.35			

^{a} N = 247–342.

^{b} These variables were logarithms.

^{c} This variable underwent arcsine transformation.

Hypothesis Testing

The hypotheses concerning applicant pool size, acceptance rate, and the length of time required to fill positions were tested using hierarchical multiple regression analyses in which sets of variables were entered into the regression equation in a prescribed order for each hypothesis using a four-step procedure. Bank characteristics and labor market conditions were assumed to have causal priority over the human resources management practices of banks, so we entered those controls as the first set of variables.[2]

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[2] As Tabachnick and Fidell (1989) suggested, we substituted the mean across all 51 cities for which the benchmark job hourly wage was available for the 16 cities for which the wage was not available (approximately 20 percent of the cases).

Taking a conservative approach to testing the major hypotheses, we entered the other human resources management practice variables as the second set and all the compensation variables except pay as the third set.[3] In the fourth step, minimum pay and the midpoint of the pay range were entered, each in a separate equation.

Table 5 presents the results of the regression analyses. The standardized regression coefficients for the final step of the regression equation including minimum pay level are shown for each dependent variable. In addition, the table indicates the change in R^2 for each set of variables entered and the final R^2 for the equation. The regression coefficient for the midpoint of the pay range (obtained from a separate regression equation) is shown as well. The significance levels of the regression coefficients in the equations for the midpoint of the pay range were the same as the levels for those in the equations using minimum pay level except for two cases (noted in Table 5), so we present only the results for the equations including minimum pay level.

Number of teller applicants. The regression results for the number of teller applicants appear in the first column of Table 5. The R^2 of the equation was highly significant. The first hypothesis was that, with the number of tellers hired controlled, pay level would be positively related to the number of teller applicants. Table 5 indicates that this hypothesis was not supported. The standardized regression coefficients for the minimum and the midpoint of the pay range were not significant.

The results for the second hypothesis, concerning the relationship between benefits and the number of tellers attracted, partially supported predictions. Adding the compensation variables produced a change in R^2 that was significant for the minimum pay equation (Table 5, column 1) and was marginally significant when the midpoint of the pay range was used ($\Delta R^2 = .05$, $p < .08$). This change was due to a significant, positive standardized regression coefficient for benefit percentage ($\beta = .14$, $p < .05$) and a significant, negative coefficient for benefit flexibility ($\beta = -.11$, $p < .05$). These results indicate that banks that devote a large percentage of total compensation to benefits attract more teller applicants than other banks, but that banks with high benefit flexibility attract fewer applicants.

The finding that benefit flexibility was negatively related to the number of applicants attracted runs counter to the second hypothesis. A possible explanation for this finding is that some banks view benefit flexibility as a relatively inexpensive method of attracting applicants, and that some banks

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[3] Benefit percentage was one of the variables with the smallest data set size. Thus, we conducted all the regression analyses twice: once including benefit percentage with the other compensation variables and once without benefit percentage. For acceptance rate and the length of time positions remained open, the regression coefficient for benefit percentage was not significant, and the removal of benefit percentage did not change the coefficients of any of the other variables included in the analyses. Thus, to preserve data, we excluded benefit percentage from the regression equations for acceptance rate and the length of time positions remained open.

TABLE 5
Results of Regression Analyses[a]

Variables	Equation 1: Number of Teller Applicants	Equation 2: Acceptance Rate	Equation 3: Time Position Open
Control			
Total assets	.31***	−.04	.22**
Net income	.00	.08	.08
Unemployment	−.07	.05	−.04
Benchmark wage	−.13*	.03	−.01
Tellers hired	.39***		
ΔR^2	.42***	.01	.10***
Other human resource practices			
Recruitment	−.01	−.06	.11[d]
Hours of training	.10	−.01	.09
Advancement	.07	.00	.13*
ΔR^2	.00	.00	.04**
Compensation			
Long-term incentives	−.03	−.01	−.06
Short-term incentives	.10	.09	.00
Bonuses	.06	.01	.01
Base pay adjustments	−.03	.03	−.08
Average percentage raise	−.09	−.20**	.18**
Basis of raise	.02	.11	.09
Benefit percentage	.14*		
Benefit flexibility	−.11*	−.05	−.17**
Paid days off	.03	.07	−.13*
Retirement plan	−.08	.13	.00
Medical coverage	−.08	.09	−.05
Medical cost	.06	.09	−.05
ΔR^2	.05*[c]	.09**	.08**
Minimum pay	−.04	.08	.14*
Midpoint pay[b]	−.04	.14*	.03
Total R^2	.47***	.11*	.24***

[a] The variables are described in the Appendix. Missing data were deleted listwise. For equations 1, 2, and 3, Ns are 245, 267, and 306, respectively.

[b] This variable was substituted for minimum pay in a separate regression equation. The significance levels for the remainder of the variables differ from those reported in the table in two cases (see notes c and d). The data set sizes for the midpoint pay equation are: 1, $N = 228$, 2, $N = 249$, 3, $N = 286$.

[c] This ΔR^2 was only marginally significant in the midpoint pay equation ($\Delta R^2 = .05$, $p < .08$).

[d] This regression coefficient was significant in the midpoint pay equation ($\beta = .12$, $p < .05$).

* $p < .05$
** $p < .01$
*** $p < .001$

that have had difficulty attracting applicants or hiring tellers in the past have recently adopted flexible benefit plans (or increased the flexibility of their plans) to boost the sizes of their applicant pools. This combination of events would produce a negative relationship between benefit flexibility and number of applicants and would indicate these banks taking a reactive stance when faced with declining numbers of applicants. To investigate this possibility, we collected additional survey data from respondents during 1989, the year following our initial data collection. A total of 127 usable questionnaires were returned, yielding a response rate of 36.1 percent for this second wave of data collection.

Reactivity would be shown if benefit flexibility at time 2 were negatively related to the number of applicants attracted at time 1. To test this proposition, we regressed benefit flexibility at time 2 on benefit flexibility at time 1, the number of teller applicants at time 1, and three control variables: total assets, benchmark wage, and number of tellers hired. As expected, the regression coefficients for the number of tellers hired and benefit flexibility, both measured at time 1, were highly significant (for both, $\beta = .29$, $p < .001$). In support of the reactivity prediction, the regression coefficient for the number of teller applicants at time 1 was negative and also highly significant ($\beta = -.20$, $p < .001$). The overall R^2 for the equation was .22 ($p < .001$).

Acceptance rate. The third and fourth hypotheses were that pay level and benefits would be positively related to acceptance rate. The results appear in column 2 of Table 5. The overall R^2 for the equation was significant. Hypothesis 3 was supported by a significant regression coefficient for the middle of the pay range ($\beta = .14$, $p < .05$), although the coefficient for the minimum of the pay range was not significant. Hypothesis 4 was not supported; none of the benefit variables yielded a significant regression coefficient.

Length of time positions remained open. The fifth and sixth hypotheses were that pay level and benefit level and form would be negatively related to this dependent variable. The results of the regression analyses appear in column 3 of Table 5. Hypothesis 5, concerning pay level, was not supported. The regression coefficient for minimum pay level was significant; however, the coefficient was positive, not negative, as was hypothesized ($\beta = .14$, $p < .05$). The regression coefficient for the midpoint of the pay range was not significant. One possible explanation for this finding is that the length of time positions remain open may be an indicator of the difficulty a bank is having hiring tellers, and it may be a factor that banks use as a basis for making a decision to raise teller pay relative to pay at other banks. This would represent a reactive stance on the part of banks, similar to the reactivity we suggest is associated with benefit flexibility.

Another possible indication of banks' responsiveness to the length of time positions remain open is the significant regression coefficient for the percentage raise given in the previous year ($\beta = .18$, $p < .01$). This finding indicates that the larger the average raise granted to tellers in a previous fiscal year, the longer positions remained open in the fiscal year under study. However, it is not possible to conclude that a large percentage raise actually boosted a bank's pay standing relative to other banks.[4] In addition, because this variable measured the average percentage raise given to tellers, it is not possible to calculate the amount by which the minimum pay level was raised during a previous fiscal year; the percentage increase for the minimum pay level may have been higher or lower than the average raise.

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[4] We would like to thank an anonymous reviewer for clarifying this point.

The additional data described above (in the section on benefit flexibility and number of applicants) provided information that was also useful for investigating the question of whether or not banks adjust their pay levels by giving raises in response to the length of time it takes to fill teller positions. Both zero-order correlations and the results of additional regression analyses were used to address this issue. First, we subtracted the minimum pay level at time 1 from the minimum pay level at time 2 to determine the amount of pay raise given at time 1. This amount was significantly and negatively correlated with minimum pay at time 1 ($r = -.32$, $p < .001$, $N = 112$), indicating that banks with the lowest pay levels at time 1 gave the largest absolute pay raises. Also, the amount of pay raise given at time 1 was positively correlated with minimum pay level at time 2 ($r = .29$, $p < .002$, $N = 112$), indicating that the pay raises were successful in increasing minimum pay relative to other banks.

Second, longitudinal analyses were conducted to test the prediction that minimum pay level at time 2 would be positively related to the length of time positions remained open at time 1. To test this idea, we regressed minimum pay at time 2 on minimum pay at time 1, the amount of time positions remained open, and two control variables (total assets and benchmark wage). In support of the prediction, the standardized regression coefficient for the time a position was open at time 1 was significant ($\beta = .10$, $p < .05$) even when minimum pay at time 1 was included in the regression equation ($\beta = .39$, $p < .001$). The overall R^2 for the equation was .21 ($p < .001$).

Hypothesis 6, concerning level of benefits, was supported. As shown in column 3 of Table 5, the compensation variables caused a significant change in R^2. Two of the standardized regression coefficients for benefit variables were significant: benefit flexibility and time off. The coefficients for benefit flexibility ($\beta = -.17$, $p < .01$) and paid days off ($\beta = -.13$, $p < .05$) were negative, providing support for Hypothesis 6. Greater flexibility in choosing benefits and more days off were found in banks that filled teller positions more quickly than did other banks.

DISCUSSION

This study investigated the relationships between characteristics of an organization's compensation system, most notably pay and benefits, and three intermediate outcomes that are thought to be related to productivity and profitability: the number of applicants attracted, their acceptance rate, and the length of time positions remain open. Findings with respect to both pay level and benefits for each dependent variable will be discussed in turn.

Teller Applicants

Pay level was not significantly related to the number of teller applicants. The choice of a pay level is often discussed as a critical decision in designing and implementing a pay structure (e.g., Milkovich, 1988; Milkovich & Newman, 1990), but this study provides no evidence of the benefits of a high pay level typically espoused by compensation researchers. Brown (1985) and Krueger (1988) gave two possible explanations for the differences in findings between the present study and past research. First, Brown and Krueger both acknowledged that a comparison of job queues in the government-military and the private sector is difficult to make because the federal government is much larger and more visible than private employers. It is possible that the strong relationship between wages and application rate that Krueger found in the public sector does not hold for this group of private sector employers because compensation practices may be less visible in the private sector, especially in banks. To investigate this issue, we sent follow-up questionnaires to a group of newly hired tellers from a large midwestern city that was included in the original study.[5] The results indicated that nearly half of the tellers were aware of some aspects of pay and benefits before they applied for jobs. Although these results indicate that many applicants are aware of compensation system characteristics before they apply, there is no way of comparing this level of visibility with that of the public sector employees examined in Krueger's study. Second, the present study is limited to one job class, a job class that is dominated by women. Although these sample differences may account for the differences in findings, Krueger's results, which showed that his findings held for individual occupational groups and for both men and women, make this explanation less plausible. Future research conducted with different private-sector employee groups will shed light on these issues.

One benefit variable, the percentage of total payroll devoted to benefits, was positively related to the number of applicants. Previous research concerning overall levels of benefits has found no relationship with application rate (Krueger, 1988). Krueger offered three potential explanations for his findings: that prospective job applicants are not immediately aware of the availability of benefits, that benefits may not be a salient or relevant feature of compensation to job applicants, and that the measure of benefits used was an unreliable measure of the value of fringe benefits to workers. The present research, which shows that the overall percentage of compensation costs devoted to benefits is positively and significantly related to the number of teller applicants even when all other compensation variables are controlled, refutes Krueger's first two explanations and points to measurement differences between the two studies as the likely reason for the differences in results. Because the results of this study indicate that a decision to lead the market in terms of benefits may pay off in terms of attracting more applicants—a result that was not found with respect to pay—the relationships between aspects of benefit programs and sizes of applicant pools is an area that deserves attention in future research, especially given the large financial investment organizations make in benefits programs.

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[5] We contacted the personnel managers of several banks within a large midwestern city and sent questionnaires to 28 tellers hired within the last three to six months. Tellers were asked about their knowledge of pay and benefits before applying, how many other jobs they applied for, and how many employment offers they received. Ninety percent of the tellers responded.

The results with respect to benefits also provided evidence that banks may respond to difficulty in attracting employees by changing aspects of their compensation practices. Longitudinal analyses provided support for a reactive explanation, that these banks might have reacted to shortages in teller applicants by increasing the flexibility of their benefit plans.

Acceptance Rate

The results of this study partially supported the third hypothesis, that pay would be positively related to acceptance rate. The regression coefficient for minimum pay rate was not significant, but the coefficient for the middle of the pay range was significant. This pattern of findings might occur if the lowest level of a pay range reflects a training wage, or a rate of pay at which tellers remain only for a short period of time. In such a situation, the midpoint of the pay range may have a greater impact on an applicant's decision to accept than the minimum rate of pay.

Only one other variable was significant: the percentage raise given in the previous fiscal year was negatively related to acceptance rate. This finding again might reflect a reactive stance on the part of banks: those banks that were having difficulty gaining acceptances once offers were made (banks with low acceptance rates in the *previous* fiscal year) might have granted large percentage increases in pay in an attempt to increase acceptance rate. However, as discussed earlier, we have no way of assessing the success of percentage pay increases in boosting a bank's pay relative to that offered by other banks because of the way the raise variable was measured, so it was not possible to examine this relationship further. The investigation of a more precise measure of pay increase and its relationship to acceptance rate will be an important area for future research.

The amount of variance explained is lower for acceptance rate than for the other dependent variables. There are two possible reasons for this difference. First, the decision to accept a job is more critical for a potential employee than is the decision to apply, and a number of variables that are best measured at the level of the individual job applicant, such as perceptions of the convenience of the location and the availability of suitable child care, may influence acceptance decisions. Future research aimed at predicting and understanding acceptance rates should include variables such as these. Second, follow-up data collected from a group of newly hired tellers in a large midwestern city indicated that most of them (80%) received only one offer of employment. If representative of the teller applicants studied overall, these findings could account for the small percentage of variance explained by the variables included in this study. That is, applicants might have accepted their first employment offer rather than waiting for multiple offers and then weighing characteristics of a bank or its compensation system before accepting a position.

Time Required to Fill Positions

Unexpectedly, pay was found to be positively related to the length of time taken to fill teller positions, indicating that the higher the current minimum pay level, the longer banks take to fill their teller positions. Longitudinal analyses again pointed to a reactive explanation—in some cases these banks seemed to be responding to the difficulty that they were having in filling teller positions by increasing their pay level with respect to that of other banks.

Alternatively, two benefit components, flexibility and paid time off, were associated with filling teller positions quickly. A possible explanation is that these are the benefits that make a difference to applicants for bank teller jobs, a group composed predominantly of young (under 40) women. It is likely that many of these applicants have employed spouses, a situation that would make benefit flexibility a highly attractive option in that it prevents duplication of coverage. In addition, many tellers may have responsibility for preschool or school-age children, who often demand their parents' time away from work because of illness, medical appointments, school holidays, and so forth, making paid time off an especially attractive benefit.

Implications for the Study of Compensation Strategy

The traditional description of compensation policy has been that employers make the choice to lead, lag, or match the competition and then adhere to that policy over a period of time (Milkovich & Newman, 1990). In this study, the patterns of results for pay level, pay raises, and, to some extent, benefits suggest that the banks studied used compensation in a reactive fashion instead of adhering to one of the policies typically described. Banks may adopt a strategy of adjusting aspects of their compensation systems in response to hiring difficulties rather than one of choosing a pay level policy and adhering to that policy long enough to recognize the benefits of the choice. The results of the longitudinal analyses of the relationships between benefit flexibility and the number of applicants and between pay and the length of time positions remained open support this notion. In addition, we conducted follow-up telephone interviews with 20 of the survey respondents, and their responses supported the finding that banks tend to react to environmental conditions when determining compensation policies.

If some of these banks had chosen the strategy of remaining with either a high or a low pay level, we would expect a very different pattern of results, a pattern that would be consistent with the hypotheses of this study. For example, we would expect those banks that had adopted high-pay-level policies two or more years before this survey was conducted to have been able to fill their positions more quickly than other banks, which would result in a negative relationship between pay and the time it takes to fill positions. In addition, we would not expect banks to change their pay levels relative to those of other banks from year to year, as the longitudinal data seem to indicate that they do. Thus, we now have a picture of banks adopting the cost control strategy of adjusting pay level (and to some extent benefits) on the basis of issues that relate to their ability to hire tellers.

If firms do switch pay policies over the short run in response to problems they encounter in attracting and retaining employees, there are implications for practice as well as research. With respect to practice, firms that adopt a reactive strategy may be successful in terms of cost control, but they may pay a price over the long run. Cost control mandates a very limited view of the usefulness of manipulating compensation; there may very well be circumstances in which a firm would be better off using compensation to generate a highly qualified and productive work force rather than focusing on short-term savings. This focus on short-term savings might lead to problems such as turnover, absenteeism, and an overall lowering of the quality and productivity of the work force. With respect to research, if firms do switch pay policies over the short run, then compensation researchers face two problems: (1) the effects of differing pay policies will be difficult to identify with cross-sectional data, and (2) correlational field studies, even those with longitudinal data, will be of limited value when researchers attempt to answer questions about the effects of long-term pay policy strategies.

The apparent adoption of strategic pay policies aimed at cost control and the reactivity of these banks is not surprising because many of the banks included in this study were small and did not have a personnel or human resource department; thus, their human resources activities may have been underdeveloped. In this situation, we would expect little in terms of long-term compensation decision making. The comparisons made between respondents and nonrespondents indicated that larger banks were slightly overrepresented in this study. Thus, we might expect compensation policies to be even more reactive in the banking industry as a whole. In addition, long-term strategic compensation policies are most likely to exist for employee groups within a firm that are considered to be strategically relevant or critical to the success of the organization (Milkovich, 1988). Within banking, tellers may not represent such an employee group. Perhaps research conducted in large banks and focused on key job classes within commercial banking or investments would reveal a more stable compensation policy. Finally, the condition of the banking industry as a whole in recent years might have contributed to the use of reactive compensation strategies as "survival tactics." It is possible that general trends in the human resources management practices characteristic of an industry may vary over time. Future research might examine this issue as well.

Limitations and Future Research Directions

This study represents a new approach to examining relationships between human resources management practices and firm performance, and it points to research needs in several areas. First, to gain control over variation due to industry and task characteristics, we conducted this study within a single occupation and industry. A service-oriented job class that is dominated by young female employees was examined. A strength of this study is that it provides information about employees that make up a large segment of the labor force and are becoming a more important part of the economy, and little research attention has been devoted to this type of employee. Dipboye and Flanagan noted that organizational field research can be described as "having produced a psychology of self-report by male, professional, technical, and managerial personnel in productive-economic organizations" (1979: 146). At this point, it seems possible that the current findings could generalize to other industries in which rather low-paying, woman-dominated job classes play an important role—for example, retail trade or health care. There still is a critical need for empirical research to determine if the results reported here generalize to other industries, job types, and job levels.

Second, there is a need to refine the measurement of the variables investigated here. We echo the plea of Jackson, Schuler, and Rivero (1989) for research to develop psychometrically sound measures of organizational characteristics as well as methods for assessing interorganization differences in human resources management practices. In addition, research that examines additional intermediate outcomes, such as the quality of applicants attracted, and more direct measures of organizational effectiveness are needed. The compensation system characteristics studied may affect measures of firm performance and productivity other than those examined herein.

Finally, any of the advantages that accrue to a firm through variations in human resources management practices that research in this area brings to light—such as attracting many applicants—need to be examined in terms of their impact on overall firm performance. Adopting this approach would lead eventually to a more complex model of human resource activities that includes the determinants of these activities, the intermediate outcomes related to them, the costs and benefits associated with those intermediate outcomes, and finally, the effects on firm performance. The measurement complexities of such a model are apparent, and Ehrenberg and Milkovich (1987) noted additional difficulties with conducting this type of research in their concluding remarks. When we consider the fact that compensation strategies most likely vary with other human resources practices that also affect firm performance, the picture becomes even more complex. However, the future of the study of human resources practice–firm performance relationships depends upon establishing the causal mechanism or mechanisms responsible for those relationships.

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APPENDIX
Definitions and Sources of Variables[a]

Control Variables

Total assets:	Bank size, defined as the logarithm of the assets of each bank in 1987, in thousands of dollars; data were from the *Rand McNally Bankers Directory.*
Net income:	Net income in 1987 for each bank (in thousands of dollars), from the *Rand McNally Bankers Directory.*
Unemployment:	Average of 12 monthly unemployment rates for the 1988 fiscal year from *Employment and Earnings* (U.S. Department of Labor, 1987, 1988a).
Benchmark wage:	Mean hourly pay for the job Accounting Clerk Level II for each city from the *Area Wage Surveys: Metropolitan Areas* (U.S. Department of Labor, 1988b).
Number of tellers hired:	The number of tellers hired within the most recently completed fiscal year.

Other Human Resources Management Practices

Recruitment:	The number of expensive recruiting methods (monetary incentives for employee referrals, private employment agencies, or newspaper advertising) used by each bank to attract applicants for teller positions.
Hours of training:	The total number of hours of formal and informal training for new and existing tellers within the past year.
Advancement:	The percentage of tellers remaining with the bank after two years who have advanced beyond the teller position for which they were hired.

Compensation Practices

Pay level (used in separate equations)	
Minimum pay:	Minimum of stated pay range.
Midpoint pay:	Midpoint of stated pay range.
Form or mix of total compensation	
Long-term incentives:	The presence or absence of long-term incentives, profit-sharing, or both.
Short-term incentives:	The presence or absence of short-term incentives.
Policies for granting increases	
Bonuses:	The presence or absence of a lump sum bonus within the most recently completed fiscal year.
Base pay adjustments:	The presence or absence of across-the-board adjustments in base pay within the most recently completed fiscal year.
Average raise:	The percentage raise granted in the previous fiscal year.
Basis of raise:	The degree to which annual raises are based upon seniority or performance.
Benefits	
Benefit percentage:	The percentage of total payroll expenditures devoted to benefits.
Benefit flexibility:	The degree of flexibility of the benefits program (one item).
Paid days off:	The total number of paid days off for a teller with between one and two years seniority (sum of number of vacation days, holidays, and paid sick days).
Retirement plan:	The presence or absence of a pension plan or other savings or retirement plan.
Medical coverage:	The dollar amount of a $10,000 major medical expense that would be covered by a teller's medical insurance (transformed to z-scores).
Medical cost:	The monthly dollar amount a teller pays in order to be eligible for medical insurance (for employee only) (transformed to z-scores).

Applicant Pool Characteristics

Teller applicants:	The logarithm of the number of applications for full-time teller positions that a bank received within the most recently completed fiscal year.
Acceptance rate:	The arcsine of the percentage of employment offers made to tellers that were accepted during the most recently completed fiscal year.
Time position open:	The logarithm of the average number of days a teller position remained open before it was filled during the most recently completed fiscal year.

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[a] All data on variables were obtained from the survey unless otherwise indicated.

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COMPLEX PATTERNS OF VERTICAL INTEGRATION IN THE FOREST PRODUCTS INDUSTRY: SYSTEMATIC AND BANKRUPTCY RISKS

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Empirical studies have found an association between vertical integration and low risk. However, other work has suggested that a complex pattern of vertical integration reduces ability to adapt to environmental turbulence and hence increases risk. This study examined the relationship between vertical integration and risk to shareholders (systematic risk) and creditors (bankruptcy risk) in the forest products industry. The results indicate that fully integrated firms have higher systematic and bankruptcy risk in turbulent product-market environments. In addition, environmental growth was associated with low creditor risk and environmental turbulence with high shareholder risk. These associations suggest the possibility of firms' using diversification strategies to shift risk between shareholders and creditors.

Vertical integration is a pattern of diversification that combines lines of business in a way that allows a company to use the outputs of one line of business as inputs for another line of business. Thus, vertically integrated firms link products in adjacent stages of production within a "value-added chain," and they internalize exchanges that would otherwise be conducted in open markets.

The importance of vertical integration is evident when one considers how widespread it is. Vertical integration is prevalent in raw-material-based industries, such as the oil, steel, aluminum, rubber, and forest products

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industries. Numerous firms operating in food products, brewing, automobiles, computers, and other industries also engage in considerable vertical integration. Vertical integration is so fundamental to the U.S. economy that it is hard to imagine any industry that is not integrated to some extent. Yet, research has not specified what effect this strategy has on the systematic risk borne by shareholders or the bankruptcy risk borne by creditors.

Recent empirical studies of vertical mergers (e.g., Chatterjee, Lubatkin, & Schoenecker, in press; Helfat & Teece, 1987) generally have supported the risk reduction benefits associated with vertical integration that Mead (1978) and Mitchell (1976) reported for the oil industry. These findings are consistent with the theory that vertically integrated firms internalize input and output activities within their boundaries to reduce the risks and costs associated with uncertain market exchanges and to capture the benefits of coordinated activities achievable through organizational hierarchies.

Although some empirical evidence seems to support the risk reduction effects of vertical integration, a growing number of strategists have convincingly argued for the opposite effect. According to Harrigan (1985b), the strategic inflexibilities associated with complex patterns of vertical integration may inhibit a firm's ability to adapt to changes in competitive conditions and business cycles. Such inhibitions may increase the risk to shareholders and creditors in the sense that variability in cash flows and returns may increase. Such disadvantages have led several authors to recommend that, in turbulent environments, firms avoid vertical integration, "deintegrate" (Barreyre, 1988), and form "network" organizations (Miles & Snow, 1986; Quinn, Doorley, & Paquette, 1990) and "value-adding" partnerships and joint ventures (Harrigan, 1985c,d).

Both the tension between various theories of vertical integration and the relatively small number of empirical tests of these theories that have been performed imply that the nature of the relationship between vertical integration and risk is not yet firmly established. Moreover, although prior studies have examined risk to shareholders, risks affecting other stakeholders, such as the bankruptcy risk creditors assume, have not been considered. The impact of differences in companies' operating environments have not been studied either, even though Thompson (1967) identified some significant contingencies more than 20 years ago. In addition, most earlier studies did not control for issues associated with risk in some environments, such as market share (cf. Woo, 1987).

Thus, several fundamental questions remain unanswered: (1) Does the overall pattern of a firm's vertical integration affect risk when other risk-related factors are controlled? (2) If the pattern has an effect, does risk increase or decrease? (3) Are the risks to different financial stakeholders affected in the same way? And (4) Does environment moderate the association between vertical integration and risk? We sought to answer these questions by taking a theoretical and methodological approach differing from that of prior research.

VERTICAL INTEGRATION AND RISK

Harrigan (1983) argued that vertical integration is not a unidimensional strategy; rather, different patterns of vertical integration display different degrees of complexity and thus require different amounts of coordination between subunits. For example, the complexity of a single-business firm engaged in one stage of production is increased when it diversifies into an adjacent stage of production. It is further increased when the firm adds operations in stages adjacent to the adjacent stage of production. Still more complexity is added when firms increase the amount of product diversification within a given stage, a construct Harrigan (1983) called breadth. The greatest complexity results when a firm becomes fully integrated with (1) many vertical linkages across many stages of production, and (2) wide product breadth within multiple stages of production. Figure 1 illustrates these increasingly complex patterns of vertical integration.

Harrigan (1983) suggested that complex, fully integrated strategies may be more risky in turbulent environments; thus, firms should try to match their strategies to their environments.

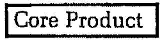
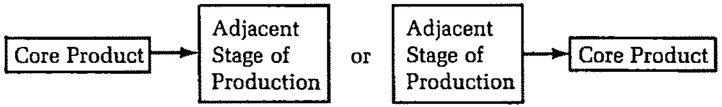
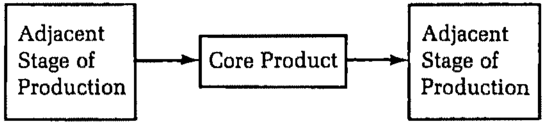
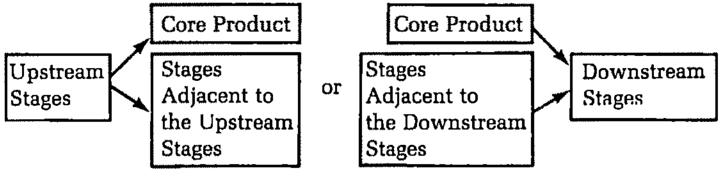
Transaction Cost Theory

Perhaps because it rests on different assumptions about firm environments, transaction cost theory alternately suggests a negative relationship between vertical integration and risk. Theoretically, integrated firms internalize input and output activities within their boundaries to reduce the risks and costs associated with uncertain market exchanges (Carlton, 1979; Coase, 1937) and to capture the benefits of coordinated activities achievable through organizational hierarchies (Williamson, 1971). Vertical integration is thus said to insulate a firm's core activities from fluctuations in its input and output environments and to smooth input supplies and output demand (Arrow, 1975; Thompson, 1967; Williamson, 1971). For example, a firm secures stable sources of supplies or guaranteed buyers when it is integrated (Carlton, 1979; Mead, 1978) and its core technology and cash flows are buffered so long as demand for its end product remains stable (Thompson, 1967).

The transaction cost case for vertical integration depends upon the existence of imperfectly competitive markets, in which suppliers or buyers can manipulate prices through supply shortages, output gluts, or small numbers of suppliers (or buyers). To achieve stable prices in less-than-perfect markets, firms must either write and monitor contracts with suppliers or buyers, or vertically integrate. The transaction cost argument assumes that integration occurs when it is the least costly way to reduce uncertainty and possible self-interested behavior by suppliers and buyers (Williamson, 1971).

Consistent with transaction cost theory, in the work of several researchers using different methods, vertical integration has been associated with reduced risk (e.g., Chatterjee et al., in press; Helfat & Teece, 1987; Mead,

FIGURE 1
Patterns of Vertical Complexity

Pattern of Vertical Integration	Proportion of Total Sales Represented by Core Product	Noncore Sales	Patterns of Vertical Diversification	Degree of Complexity
Single product	Large	None		Very low
Dominant business	Large	Small number of vertical links to immediately adjacent stages	 Core Product Adjacent Stage of Production or Adjacent Stage of Production Core Product	Low
Long-linked integrated	Moderate	Moderate number of links to adjacent stages and products linked to the adjacent stages	 Adjacent Stage of Production Core Product Adjacent Stage of Production	Moderate
Semi-fully integrated	Small	Further integration into products not forward and backward from the core product (more breadth within stages)	 Upstream Stages Core Product Stages Adjacent to the Upstream Stages or Core Product Stages Adjacent to the Downstream Stages Downstream Stages	Moderately high
Fully integrated	Very small	Many links in a "bushy tree" pattern, as illustrated for Champion International in Figure 3	See Figure 3 for an illustration of a fully integrated firm	High

1978; Mitchell, 1976). However, other studies of vertical integration and risk have found no or mixed relationships between the two variables (Lubatkin & O'Neill, 1987; Pennings, Hambrick, & MacMillan, 1984). Lubatkin and Rogers (1989) reported that over the 1940s–1960s period, vertically integrated firms had a higher level of shareholder risk than both single-business firms and firms engaged in related-constrained or linked diversification (as defined by Rumelt, 1974), and that vertical integration was far more likely than any other strategy to destroy firm value. Moreover, the statistical associations between vertical integration and risk were mostly insignificant. Thus, the finding of a negative risk–vertical integration relationship is not conclusive.

In addition, many of the studies that have found a risk-reducing effect of integration have been based on measures that did not address the full range of complexity inherent in different patterns of vertical integration. Instead, these measures addressed only integration that is tightly constrained to immediately adjacent stages of production (e.g., Chatterjee et al., in press; Helfat & Teece, 1987; Mead, 1978; Mitchell, 1976), such as vertical mergers into industries that have high input-output transfers, and input self-sufficiency ratios for oil refineries. Consequently, current empirical research has not yet identified the relationship between risk and the overall pattern of integration illustrated in Figure 1. The research has especially ignored the risks inherent in the complexity of fully integrated firms (Harrigan, 1985b). Finally, previous studies of risk and vertical integration have not considered the effects of environmental turbulence on the desirability of complex patterns of vertical integration, even though vertical integration is less likely to occur in industries with rapid changes in technology, demand, or competition than in more stable industrial environments (Balakrishnan & Wernerfelt, 1986).

Strategic Theories of Vertical Integration and Risk

Recent anecdotal evidence about the problems of highly integrated firms in fast-changing, highly competitive environments has lead several authors to question the risk-reducing benefits of vertical integration, especially in turbulent environments (Barreyre, 1988; Miles & Snow, 1986; Quinn et al., 1990). Quinn and associates, for example, noted that firms operating in competitive, turbulent environments can lower risk by avoiding vertical integration. Given a market that is functioning well for "outsourcing," firms are often better off selecting the best external suppliers and distributors than they are relying on inferior in-house activities. In competitive and highly turbulent environments, outsourcing can decrease a firm's risk by hiring suppliers with the best talent in the world, quickly substituting competitor's components or services for inferior ones produced in-house, switching supply sources when new technologies appear, and avoiding idle capacity and inventory swings in the entire production chain during cyclical or temporary downturns. In addition, avoiding vertical integration creates the motivation, flexibility, and lowered bureaucracy and overhead costs of a much more decentralized activity (Quinn et al., 1990).

Thus, vertical integration may inhibit effective adaptation in turbulent, highly competitive environments, such as those in which numerous cost-conscious competitors compete vigorously, technology changes quickly or drastically, or demand uncertainty exists. This adaptation problem may outweigh efforts to reduce risk by smoothing inputs. Vertical integration may therefore reduce risk only when input supplies are severely disrupted. Consequently, the earlier findings of Mead (1978) and Mitchell (1976) may not be generalizable because they were based on the oil industry in the 1970s.

In sum, if the benefits of smoothing inputs are unattainable, temporary, or insignificant, a complex pattern of vertical integration may inhibit adaptation to changing competitive conditions and business cycles, and therefore, vertical integration may increase a firm's risk. The current empirical literature has not yet examined the effects of complex patterns of integration in turbulent environments in which there is a competitive market for input supplies or output demand.

SHAREHOLDER VERSUS CREDITOR RISK: A MULTIPLE STAKEHOLDER APPROACH

A second issue prior empirical studies have left unaddressed is the effect of vertical integration on the risk of the multiple financial stakeholders of firms. Common definitions of risk, such as "the chance of injury, damage, or loss" (*Webster's New World Dictionary*), can apply equally to a firm's shareholders and creditors. Firm managers seek external financing, either in the form of debt or equity, when internal cash flows are insufficient to support growing capital project demands. If both bonds and stocks are issued, shareholders and creditors become joint "owners" of firm cash flows and thus are both subject to the risk associated with variance in them.

Agency theory suggests that there may be trade-offs between shareholder and creditor risks, in that shareholders may be more likely to undertake high-risk projects if they can convince creditors to finance them (Barnea, Haugen, & Senbet, 1981; Smith & Warner, 1979). However, there is no clear evidence about how a vertical integration strategy might affect creditor risk, especially since there has been little theoretical work on the relationship between issues affecting the risk of default or bankruptcy borne by creditors and risks measured by stock market fluctuations (Miller & Bromiley, 1990). Moreover, some of the empirical evidence on the relationship between vertical integration and risk is unclear as to whose risk is being affected. For example, the early oil industry studies used measures of total risk, such as ratings from Standard & Poors (Mitchell, 1976) and intertemporal variance in accounting returns (Mead, 1978), rather than systematic risk.

It is important to consider both creditor and shareholder risk to see if vertical integration increases risk for both stakeholders or merely shifts risk from one type of investor to another. For example, some patterns of diversification, like unrelatedness, may reduce risk for creditors and managers at the expense of stockholders, who could have diversified their own portfolios more efficiently. Conversely, creditors may bear firm-specific risks that shareholders can diversify away. Yet it is also possible that patterns of diversification like vertical integration influence creditors and shareholders similarly. Minimization of firm-specific risk, for example, creates important competitive advantages favoring both shareholders and creditors, including the ability to acquire production factors at low cost (Amit & Wernerfelt, 1990).

HYPOTHESES

Patterns of Vertical Integration and Shareholder Risk

Systematic risk, or "beta" in Lintner's (1965a,b) and Sharpe's (1964) capital asset pricing model (CAPM), is the risk most relevant to shareholders. Systematic risk is the portion of a stock's return variance that is systematically related to general economic conditions, such as business cycles. This type of risk is most relevant to shareholders because they can not eliminate it by diversifying their portfolios of stocks.

Fully integrated firms have a pattern of vertical integration that creates organizational complexity and inflexibility, thereby increasing their systematic risk. Complex vertical integration may make a firm less adaptive to business cycles and other economy-wide shifts, and that failure to adapt makes cash flows, and hence stock market returns, especially vulnerable to shifts that affect other firms in the stock market to a lesser degree. Thus, full vertical integration makes a firm's returns more highly correlated with the returns of the overall market, raising its systematic risk.

Fully integrated firms may be less adaptive than other firms to the turbulence of economy-wide changes for two reasons. First, fully integrated firms have many vertical links between their product lines, leading to high interdependence among them. Such interdependence may make it hard for a firm to adapt to business cycles or technological changes that influence the entire stock market because of difficulties in changing strategies, abandoning obsolete technologies, monitoring information about product markets that have been absorbed into the firm's boundaries, or filling unevenly balanced upstream or downstream capacity (Harrigan, 1985b,d). This inflexibility is especially problematic if new communication and information-processing technologies are allowing competitors to capture the benefits of vertical integration by outsourcing and using just-in-time inventory systems in place of vertical integration and internal administrative hierarchies (Barreyre, 1988; Miles & Snow, 1986; Quinn et al., 1990).

A second reason that a fully integrated firm is less adaptive to the turbulence created by economy-wide changes is that it has moved far away from its "center of gravity" (Galbraith & Kazanjian, 1986). Vertical integration that is not tightly linked to the firm's original business may result in a lack of information among corporate-level managers about the noncore businesses, which creates difficulties in coordinating the complex interactions between subunits. If the integration is constrained—tightly vertically linked to the core product—corporate managers can better recognize and understand the implications of economy-wide changes for coordination of the noncore and core product lines. Hence, they may be cognitively equipped to initiate and guide adaptive actions that cope with these changes.

As firms diversify into areas not very closely linked to their core products (for instance, a logging company enters newsprint production and publishing), the critical success factors and "dominant logics" (Prahalad & Bettis, 1986) of the added product lines become unfamiliar to top managers trained in their core businesses. This problem might be solved by decentralizing a company and creating independent subunits with general managers trained in its noncore businesses. Decentralization, however, only worsens the problem of coordination in a fully integrated, vertically complex company. Too much decentralization may even eliminate the benefits derived from coordinating interdependent subunits via vertical integration.

In sum, complex patterns of vertical integration may create inflexibilities and complexities (Harrigan, 1983: 5; 1985b) that prevent effective adaptation to turbulence created by economy-wide factors. These arguments suggest the following:

> *Hypothesis 1: Complexity inherent in patterns of vertical integration will be positively associated with systematic risk.*
>
> *Hypothesis 2: Complexity inherent in patterns of vertical integration will be more positively associated with systematic risk in turbulent product-market environments than stable product-market environments.*

Patterns of Vertical Integration and Creditor Risk

Creditors assume the risk of default on the loans made to a firm. This risk is also called bankruptcy risk because loan default triggers bankruptcy (Altman, 1983). The relationship between bankruptcy risk and shareholders' systematic risk is not clear. Using factor analysis, Miller and Bromiley (1990) found that stock market and bankruptcy risk fell onto different factors, suggesting that these risks are different constructs. The primary influence on the risk of bankruptcy is a firm's ability to pay its debts. However, in addition to bankruptcy risk, shareholders assume the residual risk of receiving payment only after creditors are paid. Variations in market returns that are subject to shifting shareholder expectations about the future of the firm also affect shareholder risk. Thus, although shareholder and creditor risks are not identical, they could be somewhat positively associated, especially if some strategies affect both types of risk.

Complex patterns of vertical integration may, for example, increase bankruptcy as well as systematic risk through the complexities and inflexibilities that make a firm less adaptive to a turbulent environment. Vertical integration inhibits needed change. This inhibition may contribute to organizational inefficiency and failure (Harrigan, 1985b,d). Fully integrated firms might be more concerned with maintaining their internal vertical exchanges than with adapting to environmental changes. They might continue to use obsolete and costly processes because of the needs of the overall system. Undercapacity may occur in stages of production where minimum efficient scale requirements lead to larger plant sizes than adjacent stages of production need. The efficiency of the overall system may break down if highly turbulent product-market conditions make scheduling intersubunit transfers difficult. Numerous inefficiencies may occur because of the cognitive inability of corporate-level managers to coordinate product lines that are far away from the firm's core business (Galbraith & Kazanjian, 1986; Prahalad & Bettis, 1986). These inefficiencies may contribute to organizational failure, especially in turbulent environments. Thus,

> *Hypothesis 3: Complexity inherent in patterns of vertical integration will be positively associated with bankruptcy risk.*
>
> *Hypothesis 4: Complexity inherent in patterns of vertical integration will be more positively associated with bankruptcy risk in turbulent product-market environments than in stable product-market environments.*

ENVIRONMENTAL EFFECTS ON RISK

Risks to shareholders and creditors are also influenced by environmental conditions, such as environmental turbulence and growth. According to the capital asset pricing model, the operating-risk component of systematic risk has an intrinsic business risk component that reflects environment-created risk that is distinguishable from firm-specific risk. Intrinsic business risk is associated with systematic risk because different environments create inherently different levels of vulnerability to business cycles for firms in that environment (Conine, 1982).

Two characteristics of a firm's product-market environment influence intrinsic business risk: environmental turbulence, or volatility, and demand growth and decline. Changes in industry structure and competition that cause some product markets to have volatile returns over time create environmental turbulence (Caves & Porter, 1977; Hurdle, 1974). Environmental turbulence will raise risk to shareholders and creditors because it creates uncertainty for managers (Cameron, Kim, & Whetten, 1987). High uncertainty makes both adaptation to competitors' actions and adjustment to business cycles difficult.

Environmental growth should lower the risks of shareholders and creditors because it encourages high volume and capacity utilization, which in turn protects even the most vulnerable firms from economy-wide trends, such as business cycles (Harrigan, 1983).

Theoretical and empirical work on organizational decline and bankruptcy has suggested that turbulence and growth-decline also importantly affect the organizational risk of bankruptcy (e.g., Aldrich, 1979; Hambrick & D'Aveni, 1988; Hannan & Freeman, 1977; Whetten, 1980). Thus,

> *Hypothesis 5: High systematic and bankruptcy risk will be associated with high environmental turbulence and low environmental growth.*

OTHER INFLUENCES ON SYSTEMATIC AND BANKRUPTCY RISK

Previous research has revealed many issues that affect both systematic and bankruptcy risk, and therefore our analyses needed to control for these issues. Financial leverage is expected to increase risk. According to the capital asset pricing model, systematic risk (beta) has two components: financial risk and operating risk (Callahan & Mohr, 1989). The financial risk component of beta is positively associated with a firm's financial leverage because the fixed interest costs associated with debt increase the vulnerability of cash flows and stock market returns to business cycles and economy-wide shocks (Bowman, 1979). Research on decline and bankruptcy by Hambrick and D'Aveni (1988) and Altman (1983) has similarly indicated an association between high financial leverage and bankruptcy because firms have only so much capacity to take on debt before the costs of borrowing exceed their ability to pay.

Capital intensity and asset specificity should also increase systematic risk because high fixed costs make a firm's returns more vulnerable to business cycles (Lev, 1974). In addition, bankruptcy risks should be higher for firms with high asset specificity and capital intensity because (1) the inability to convert assets to other uses reduces a firm's ability to adapt to changing environments by raising the costs of changing strategy, and (2) committing cash flows to the payment of fixed operating costs reduces the cash available for changes.

Market power should be associated with decreased risk. Researchers have often used organizational size and market share as proxies for market power. According to the CAPM, the operating risk of a firm can be reduced if it has enough market power to reduce its vulnerability to economic swings by pushing the burden of economic downturns onto weaker firms, such as suppliers (Moyer & Chatfield, 1983). Market share and firm size also have been shown to be negatively associated with accounting-based measures of risk (Hurdle, 1974), which have in turn been shown to be positively associated with systematic risk (Beaver, Kettler, & Scholes, 1970). In addition, numerous authors (e.g., Aldrich, 1979; Hannan & Freeman, 1977; Whetten, 1980) have noted that power over the environment, especially the power of large firms, decreases the risk of failure and bankruptcy. Thus, research on bankruptcy and the CAPM suggested that we should control for the confounding effects of financial leverage, capital intensity, asset specificity, and market power.

METHODS

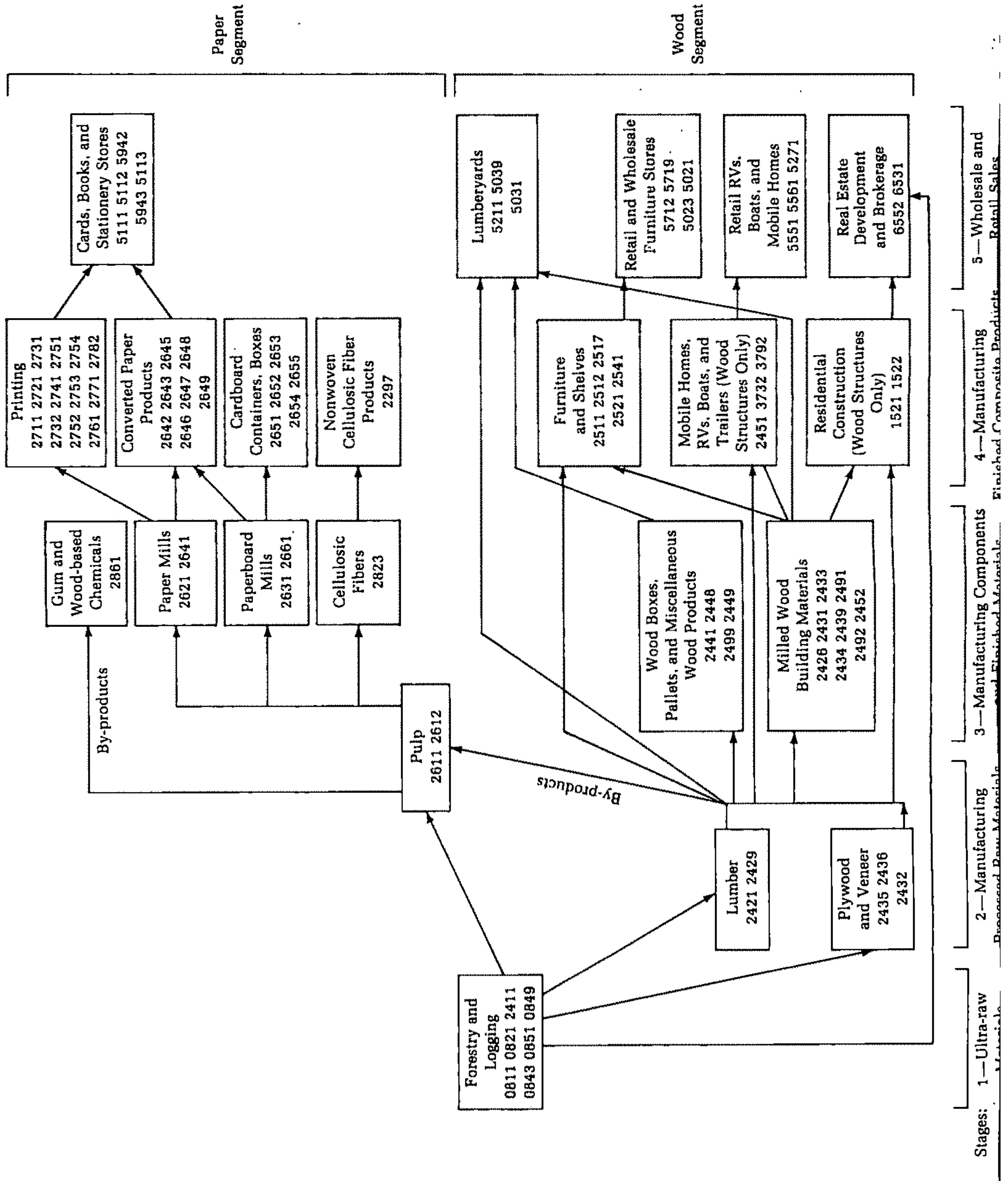
We chose the forest products industry in 1985 for this study. We chose forest products because firms in that industry can adopt widely different patterns of vertical integration based on divergent choices about number of vertical linkages and degree of vertical diversification away from core product markets. Moreover, the forest products industry makes up 7 percent of the GNP of the entire United States and sells end products within almost all segments of the economy (Sonnenfeld, 1981), thereby allowing firms to integrate widely. We chose 1985 because it was a particularly turbulent year for the forest products industry. In addition, the time period and industry differ from those of the oil industry studies.

Industry Definition

The industry in this study was defined by first identifying the forest products value-added chain—all the steps of growing and harvesting trees, processing and converting materials, and manufacturing and selling products. We then defined the limits of the industry within this chain. We developed the forest products value-added chain, illustrated in Figure 2, in several steps. First, we assigned product lines defined by four-digit Standard Industrial Code (SIC) classifications to product groups, represented by the boxes in Figure 2. Product groups were defined as sets of products with similar inputs, production processes, and customers. The assignments were based on interviews with practicing engineers and managers in the forest products industry and with faculty members of the North Carolina State University School of Wood and Paper Science. We interviewed each individual separately. The second step was to assign the product groups to the five stages of production shown in Figure 2 and to identify typical transfers between product groups, represented by the arrows in the diagram. Starting with a simple diagram used by Globerman and Schwindt (1986), we produced more complex diagrams in multiple iterations until the industry experts at the North Carolina State University School of Wood and Paper Science agreed that our diagram was complete and accurate. Each expert reviewed several draft diagrams in a series of meetings, and each had veto power over the diagrams. We discussed conflicting evaluations with the experts until a consensus was achieved, with all agreeing to the accuracy and completeness of the figure. Appendix A provides the guidelines used to construct the value-added chain in Figure 2 and a technical description of the stages of production and vertical transfers in this chain.

Next, we used this diagram of the forest products value-added chain to define the boundaries of the forest products industry. Roughly following the industry definition used by Ellefson and Stone (1984), we limited the industry to the set of firms having at least 50 percent of their sales in one or more of the following product groups from Figure 2: (1) forestry and logging, (2) lumber, (3) plywood and veneer, (4) pulp, (5) paper mills, (6) paperboard

FIGURE 2
Product Groups and Transfers in the Forest Products Value-Added Chain


Paper Segment
Wood Segment
Cards, Books, and Stationery Stores 5111 5112 5942 5943 5113
Printing 2711 2721 2731 2732 2741 2751 2752 2753 2754 2761 2771 2782
Converted Paper Products 2642 2643 2645 2646 2647 2648 2649
Cardboard Containers, Boxes 2651 2652 2653 2654 2655
Nonwoven Cellulosic Fiber Products 2297
Gum and Wood-based Chemicals 2861
Paper Mills 2621 2641
Paperboard Mills 2631 2661
Cellulosic Fibers 2823
By-products
Pulp 2611 2612
By-products
Forestry and Logging 0811 0821 2411 0843 0851 0849
Lumber 2421 2429
Plywood and Veneer 2435 2436 2432
Wood Boxes, Pallets, and Miscellaneous Wood Products 2441 2448 2499 2449
Milled Wood Building Materials 2426 2431 2433 2434 2439 2491 2492 2452
Furniture and Shelves 2511 2512 2517 2521 2541
Mobile Homes, RVs, Boats, and Trailers (Wood Structures Only) 2451 3732 3792
Residential Construction (Wood Structures Only) 1521 1522
Lumberyards 5211 5039 5031
Retail and Wholesale Furniture Stores 5712 5719 5023 5021
Retail RVs, Boats, and Mobile Homes 5551 5561 5271
Real Estate Development and Brokerage 6552 6531
Stages: 1—Ultra-raw
2—Manufacturing
3—Manufacturing Components
4—Manufacturing
5—Wholesale and

mills, (7) wood boxes and pallets, (8) milled-wood building materials, (9) converted paper products, and (10) cardboard boxes.

Selection of Companies

A cross-section of firms in the forest products industry at the end of 1985 was chosen. All firms listed in the 1986 volume of *Ward's Business Directory* under any of the three-digit SIC codes shown in Figure 2 were identified. Using data on sales by four-digit product line from Trinet's Establishment Database (formerly E.I.S.), we excluded any firm that did not have at least 50 percent of its sales within the ten product groups listed above. Trinet contains data on over 400,000 establishments with 20 or more employees in the United States, including sales, the names of parent companies, and four-digit SIC codes. We aggregated the Trinet data up to the parent-company level to determine whether each parent's sales distribution met the 50 percent test. We did not use Rumelt's (1974) 70 percent criterion because doing so would have unnecessarily reduced the breadth and width of vertical diversification represented by studied firms, thereby restricting the range of one of our independent variables. However, a 50 percent cutoff was needed to identify firms that were predominantly in the forest products industry.

The next step was elimination of all firms that were not listed on the Center for Research in Security Prices (CRSP) data tapes. This deletion was necessary for estimating betas. The difficulty of finding complete data for all the variables left a group of 25 firms, despite our having started with a list of over 100 firms. Data availability biased the study group toward the larger firms in the industry, those with an average size of $2 billion, based on the book value of their total assets. The range was $18.5 million to $6.1 billion. On the average, these firms had 80.4 percent (s.d. = 13.6) of their sales in the forest products industry, with 15.6 percent of their sales in the wood segment of the industry, including logging, and 64.8 percent in the paper segment. Only two firms had more than 50 percent of their sales in the wood segment. We checked to see if the results were sensitive to the inclusion of these two firms and found that dropping them had no effect, other than slightly changing significance levels.

Also, on the average, the studied firms had 92.2 percent (s.d. = 11.0) of their sales in the forest products value-added chain illustrated in Figure 2, with 1.5 percent of their sales coming from stage 1 activities (logging), 11.4 percent from stage 2 (raw material processing), 43.2 percent from stage 3 (components and finished materials), 25.8 percent from stage 4 (finished composite products), and 10.3 percent from stage 5 activities (retailing). Only two firms were diversified so that more than 15 percent of their sales were outside the forest products value-added chain. Sensitivity analyses indicated that dropping these two firms had no effect on our results other than slightly changing significance levels.

In order to conserve the small number of degrees of freedom in our study group, we combined some variables into scales. Others were dropped where multicollinearity was present.

Measures

Complexity of vertical integration. Patterns of vertical integration in which there are a large number of vertical links between products create complexity because these links imply interdependencies that must be coordinated. Complexity is decreased if a firm's diversification is constrained to products in adjacent stages of production because there are relatively few cognitive problems in coordinating and managing noncore products that are very closely related to a firm's center of gravity.

We therefore measured the complexity associated with a firm's pattern of integration with a scale composed of two variables: (1) the number of links between stages of production, which indicated increased complexity, and (2) Gort's (1962) measure of constrained vertical diversification, which indicated decreased complexity. We constructed the scale by subtracting the second variable from the first after standardizing ($\bar{x}$ = 0, s.d. = 1) the items. Coefficient alpha for the scale was .87.

To compute the number of vertical links created by a firm's product portfolio, we first identified whether the firm had sales in each of the areas represented by the boxes in Figure 2. If sales existed in any two boxes connected by an arrow in the diagram, we counted the arrow as a potential vertical link between product groups. A firm's overall linkage score was the total number of arrows counted.

We used Trinet's 1985 Establishment Database to compute Gort's (1962) measure of constrained vertical diversification according to the following formula: sales in ancillary activities divided by the quantity of total sales less the sales in the core product group. An ancillary activity was any product group, other than a firm's core product group, that could be traced backward or forward through the vertical links shown in Figure 2 to a stage of production adjacent to the core product group or adjacent to one of the adjacent stages of production. We defined the core product group as the product group in which a firm had its largest percentage of sales. The purpose of the Gort measure was to measure the proportion of a firm's noncore sales that were activities vertically supporting the core product group. Thus, it is a measure of whether a firm's vertical diversification was chosen to support the core product group. A low score on the Gort measure indicates that the firm's portfolio is only loosely vertically related to its core because the firm has selected wide breadth by operating in parts of the value-added chain that do not support the core product group. If a firm operated in only one product group in the forest products chain, making the denominator of the measure zero, we assigned it a score of one because it is highly constrained to its core and displays the least complex pattern in the study.[1] Appendix B illustrates how these measures were calculated for the fully integrated company illustrated in Figure 3.[2]

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[1] Only two studied firms were single-product firms and received scores of one on Gort's measure. Sensitivity tests indicated that dropping these two cases did not change results.

A low score on the two-item scale indicated low complexity, with few links and high constraint. A high score indicated high complexity, with many links and low constraint. Single-product firms received the lowest score. Firms with a dominant core and a small number of links to adjacent stages received moderately low scores. Firms operating in several stages of production or with some breadth within a single stage of production received intermediate scores. Fully integrated firms received the highest score. Since the two items used in the scale were highly negatively correlated ($r = -.77$, $p < .001$), we did not find combinations such as many links and high constraint or few links and low constraint. A qualitative review of the companies indicated that almost all employed stable vertical integration strategies from 1980 to 1985.

Risk. Systematic risk is the covariance of a firm's monthly market returns—stock price appreciation plus dividends divided by initial stock price—with the average monthly returns for the market as a whole. We measured systematic risk using betas computed from a regression model based on monthly stock market returns from the CRSP tapes for the 60 months ending on December 31, 1985. Thus, beta was computed for each firm using the standard CAPM model, $R - Rf = a + b \times (MR - Rf) + u$, where b is beta, R is return on common stock, including capital gains and dividends, Rf is the risk-free rate established using short-term treasury bill rates from CRSP, MR is the average return of the market portfolio, a is a constant, and u is a stochastic error term. We used the returns of an equally weighted portfolio of all stocks traded on the New York Stock Exchange as the market proxy. A high beta indicated high vulnerability to economy-wide changes and, therefore, high risk to shareholders. The same results were

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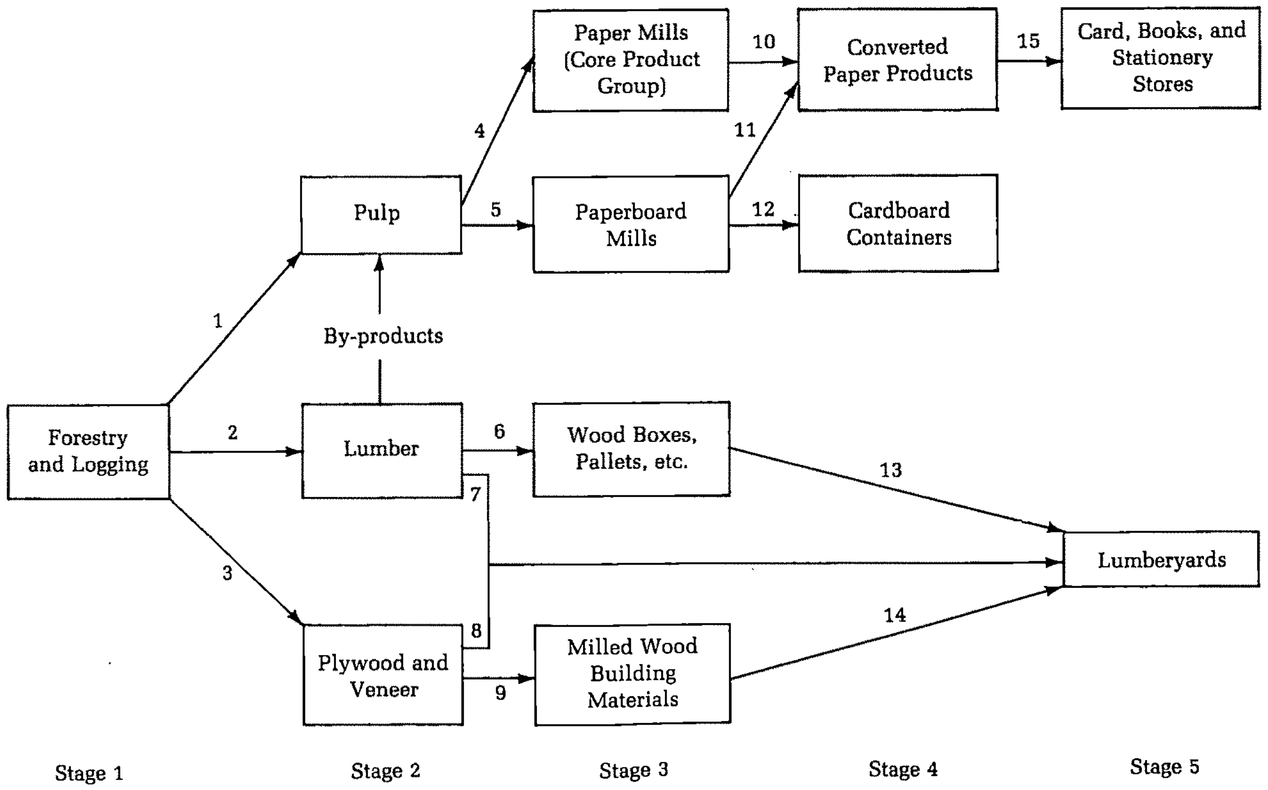
[2] We did not use accounting-based measures of vertical integration, like those used by Adelman (1955), Buzzell (1983), MacMillan, Hambrick, and Pennings (1986), Scherer (1970), and Tucker and Wilder (1977), because they did not capture complexity in the patterns of firms' vertically diversified portfolios. Moreover, they yielded nonsensical negative values for several firms. Adelman (1955) pointed out that accounting-based measures are only a proxy, and they tend to be distorted by factors that can create negative values.

Rumelt's vertical integration ratio (1974: 23,29) was not used; it measures vertical diversification as the ratio of vertically related sales to total sales. Rumelt included core (largest) product sales and all sales within a value-added chain, even if they were not directly related to a firm's core product. Consequently, researchers have used Rumelt's measure for distinguishing integrated and nonintegrated firms. In a highly integrated industry, all firms have high Rumelt vertical ratios, almost by definition. Thus, the emphasis shifts to distinguishing the different patterns of vertical diversification that integrated firms employ.

Finally, we did not use the measures of vertical integration Harrigan (1983, 1985a) created. However, to develop Figure 2 and to calculate Gort's measure of vertical integration, we did use two of her concepts: (1) the number of stages of production spanned by a firm's vertical activities, and (2) the breadth (number) of related activities within a given stage of production. Harrigan's extension of vertical integration into these dimensions clarifies Gort's notion of ancillary activities by providing a framework for identifying such activities.

FIGURE 3
Champion International



obtained even when we omitted the adjustment for the risk-free rate in our estimations of beta.

The risk of bankruptcy was measured using a modification of Altman's (1983) Z-score, a well-established measure of risk of default on debt, defined as $Z = (1.2 \times LIQ) + (1.4 \times RE) + (3.3 \times ROA) + (0.6 \times MED) + (1.0 \times CAPINT)$, where Z is the overall index of risk of bankruptcy, *LIQ* is working capital divided by total assets, *RE* is retained earnings divided by total assets, *ROA* is earnings before interest and taxes divided by total assets, *MED* is market value of equity divided by the book value of total liabilities, and *CAPINT* is sales divided by total assets. A high Z indicates a low risk of default, with 2.675 being the optimal cutoff between safe and failing firms (Altman, 1983). In the study group, 14 firms (56 percent) fell below this cutoff value.

Because some of the regression models used to test the hypotheses included measures of debt to equity and sales to assets, we eliminated the last two items to form a modified Z-score for use in our statistical tests. The modified Z was correlated almost perfectly ($r = .94$, $p < .0001$) with the original Z, and all our qualitative conclusions were identical whether the modified or the original score was used. For these measures, we used financial data as of December 31, 1985 from the CRSP and COMPUSTAT tapes.

Other key variables. Control variables included market power, financial leverage, capital intensity, and asset specificity. To conserve degrees of freedom in the regression analyses, we devised a scale using organizational size and weighted product-market share to measure *market power*. Each item was standardized ($\bar{x} = 0$, s.d. $= 1$) to eliminate differences in the units of measurement. Weighted product-market share was calculated by weighting each firm's 1985 market share in each four-digit SIC product line in which it operated in proportion to its percentage of sales in each product line for that year. Data were obtained from the Trinet data base. Organizational size was the "book value"[3] of total assets, expressed in millions of dollars; data were from the COMPUSTAT tapes for December 31, 1985. Coefficient alpha for the market power scale was .859.

Financial leverage was measured as the ratio of long-term debt to the book value of total equity as shown on the balance sheet. *Capital intensity* was measured as the ratio of total sales to the gross value of a firm's plant, property, and equipment. Data for both these measures were again from COMPUSTAT for December 31, 1985. *Asset specificity* was measured as the proportion of a firm's sales in the paper and pulp mills product groups of the forest products industry in 1985. Data were from the Trinet data base. We focused on this segment of sales because paper and pulp mills are highly capital-intensive plants, often costing up to $1 billion each, that cannot be converted to other uses without massive expenditures (Globerman & Schwindt, 1986). Other aspects of the forest products industry do not involve the same degree of investment in high-cost, nonconvertible plants (Ellefson & Stone, 1984).

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[3] The book value of total assets is the dollar amount of a firm's total assets according to generally accepted accounting practices, as reported in the firm's annual report.

The *weighted environmental growth rate* was measured as the average 1985 environmental growth rate in all the four-digit SIC product lines in which a firm operated weighted in proportion to the percentage of the firm's sales in each category as reported in the Trinet data base. The environmental growth rate was calculated from the total product sales of all firms in each SIC category reported in such U.S. government publications as the *Annual Survey of Manufacturers*. In sum, this is a measure of industry sales growth rate.

Weighted environmental turbulence was measured using the weighted average of the volatility for each of the four-digit SIC product lines in which a firm operated. Each volatility was weighted in proportion to the percentage of sales in the category. The weightings were based on averaging 1983 and 1985 category sales percentages reported in the Trinet data base. The measure of volatility was the intertemporal variance in the average return on equity (ROE) for firms in each SIC category, as reported in Dun & Bradstreet's *Industry Norms and Key Business Ratios*. In sum, this is a measure of industry risk measured as variance in ROE.

The measures of market share and environmental growth and turbulence were weighted because portfolio theory suggests that a firm's operating risk is the aggregate of the operating risk of each of its product lines and that the "unlevered" beta of a diversified firm is simply the sum of the unlevered betas for each product line weighted by the proportion of assets invested in each (Callahan & Mohr, 1989).

Research Design and Statistical Analyses

The hypotheses were tested using ordinary-least-squares (OLS) regression analysis. The two risk measures were regressed on the complexity of vertical integration, environmental growth, environmental turbulence, market power, asset specificity, financial leverage, and a multiplicative interaction term. The interaction term, complexity of vertical integration times environmental turbulence, was designed to test Hypotheses 2 and 4, which concern the riskiness of vertical integration in turbulent environments. We also tested the interaction of environmental growth and vertical integration, but since it was not significant in any test, we dropped the term from the OLS models and do not report results including it.

One of the control variables, capital intensity, was dropped from the regression analyses because the collinearity diagnostics of Belsley, Kuh, and Welsch (1980) indicated that it was highly multicollinear with environmental growth. The results for the equations lacking capital intensity were consistent with the results of equations lacking environmental growth. Collinearity diagnostics also indicated that market power and complexity of vertical integration might be multicollinear; however, dropping market power from the model indicated that multicollinearity had no material effect on the results.

The OLS regression results were quite robust, as indicated by the very high adjusted R^2 values, especially for the models using the modified Z-score as the dependent variable. The regression results were also quite stable. Because the study group was small, we tested the stability of our results by using a "bootstrapping" technique that identifies the effects of outliers, if any exist. For each of the OLS models reported in Tables 2 and 3, we computed 25 regression equations. We dropped one of the observations from the data in each equation to see if the parameter estimates remained stable as the data changed, calculated averages for each parameter using the 25 estimates, and compared these averages to zero using *t*-tests. The significance levels of the parameter averages were then used to determine the stability of the OLS parameter estimates. However, only the significance levels of the OLS parameter estimates should be used to determine the significance of the relationship between the independent and dependent variables.

The bootstrapping process indicated that the parameters were stable; they were significantly different from zero and had small standard deviations (Tables 2 and 3, below). In addition, the OLS parameter estimates based on the full data set were all robust. They were not significantly different from the estimates resulting from the bootstrapping procedure, being within one standard deviation of the latter. Cook *D*s for each observation were also less than one (cf. Kleinbaum, Kupper, & Muller, 1988: 200–201).

Several other regression analyses were conducted to assess the effects on risk of increased diversification and diversification into particular stages of production or segments of an industry. These computations involved adding control variables to the OLS regression models. In a series of separate regression equations, we added the following one at a time: the percentage of a firm's sales in the wood segment of the industry, the percentage in the paper segment, the percentage in each of the five stages of production shown in Figure 2, and a Herfindahl-type measure of diversification (Montgomery, 1982). The diversification measure was one minus the sum of the squares of the proportion of a firm's sales in each of its four-digit SIC codes; thus, a high score represented widely dispersed sales.

For the regression equations using systematic risk as the dependent variable, none of these controls were significant, nor did they have any effect on the other parameters in the models. We therefore do not report those models. For the equations using risk of bankruptcy as the dependent variable, only the percentage of sales in stage 5 (retailing) was significant; we include this measure in the models of bankruptcy risk. In general, however, weighted environmental growth and volatility seemed to capture the most important effects of the firms' product-market selections.

RESULTS

Table 1 presents descriptive data about the items used in the scales and regression analyses reported in this study. All the variables showed ade-

TABLE 1
Descriptive Statistics[a]

Variables	Means	s.d.	Pearson Correlation Coefficients 1	2	3	4	5	6	7	8	9	10	11
1. Systematic risk	1.22	0.32											
2. Bankruptcy risk	0.97	0.47	−.38†										
3. Complexity of vertical integration	0.00	1.88	.64***	−.55**									
4. Number of vertical links	10.08	8.08	.54**	−.50**	.94***								
5. Gort's measure of constrained vertical integration	0.59	0.27	−.67***	.52**	−.94***	−.77***							
6. Proportion of sales in retailing	0.10	0.10	.14	−.30	.16	.26	−.05						
7. Weighted environmental turbulence	8.11	3.49	.47*	.09	.21	.25	−.15	.03					
8. Capital intensity[b]	1.65	1.44	−.13	.46*	−.30	−.30	.27	.14	.01				
9. Weighted environmental growth rate	−0.01	0.03	−.01	.49*	−.24	−.26	.18	.28	.15	.72***			
10. Financial leverage	0.67	0.51	.24	−.55**	.00	−.02	−.03	.05	−.01	.08	−.25		
11. Market power	0.00	1.87	.34†	−.40*	.69***	.73***	−.58**	.13	−.01	−.31	−.24	−.13	
12. Asset specificity	0.28	0.28	−.21	.19	−.04	−.05	.02	.10	−.52**	−.12	.00	−.34†	.12

[a] N = 25.

[b] This variable was dropped from analyses because of its high correlation with the weighted environmental growth rates.

† $p < .10$, two-tailed test
* $p < .05$, two-tailed test
** $p < .01$, two-tailed test
*** $p < .001$, two-tailed test

TABLE 2
Results of the Regression Analysis for Systematic Risk[a]

	OLS Results[b]		Bootstrapping Results[c]	
Independent Variables	**Unstandardized Parameter Estimates**	**Standard Errors**	**Average Parameter Estimates**	**Standard Deviations**
Complexity of vertical integration	−.070	.101	−.074***	.030
Weighted environmental growth rate	1.193	1.904	1.225***	.455
Weighted environmental turbulence	.047*	.017	.047***	.003
Financial leverage	.157	.098	.157***	.028
Market power[d]	−.003	.033	−.003†	.009
Asset specificity	.099	.202	.098***	.048
Complexity of vertical integration by environmental turbulence	.018†	.010	.018***	.002
Intercept	.693**	.205	.694***	.040
Overall *F*	5.257**		5.084***	.556
Adjusted R^2	.554		.552***	.034

[a] N = 25.

[b] The results remained unchanged when we added variables to control for (1) the proportion of a firm's sales in each of the five stages of production, (2) the proportion of sales in the wood segment (versus paper), and (3) the dispersion of each firm's sales across four-digit SIC categories. The last variable was a Herfindahl-type measure of dispersion:

$$1 - \sum_{i=1}^{n} P_i^2,$$

where

P_i = the proportion of sales in each four-digit SIC category,

and

n = the number of SIC categories.

None of these control variables were significant and therefore the regression equations including these variables are not reported.

[c] These results are based on the averages from 25 equations, each dropping one observation at a time. *T*-tests are comparisons to zero. A significant result indicates a stable parameter estimate, not a significant relationship with the dependent variable. Only the OLS results indicate the significance of the relationship with the dependent variable.

[d] Despite its high correlation with other variables, dropping market power from the OLS model did not change the qualitative results, but the adjusted R^2 for the OLS model increased to .578.

† $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

TABLE 3
Results of the Regression Analysis for Bankruptcy Risk[a]

	OLS Results[b]		Bootstrapping Results[c]	
Independent Variables	**Unstandardized Parameter Estimates**	**Standard Errors**	**Average Parameter Estimates**	**Standard Deviations**
Complexity of vertical integration	.156	.106	.157***	.034
Weighted environmental growth rate	7.428***	2.141	7.437***	.696
Weighted environmental turbulence	.014	.018	.014***	.006
Financial leverage	−.284*	.104	−.285***	.034
Market power[d]	−.016	.035	−.016***	.009
Asset specificity	.424†	.213	.420***	.086
Proportion of sales in retailing	−1.530**	.484	−1.399***	.637
Complexity of vertical integration by environmental turbulence	−.027*	.010	−.027***	.003
Intercept	1.182***	.217	1.185***	.063
Overall F	11.526***		11.237***	1.291
Adjusted R^2	.778		.779***	.021

[a] $N = 25$.

[b] Please see Table 2, footnote b.

[c] Please see Table 2, footnote c.

[d] Despite its high correlation with other variables, dropping market power from the OLS model did not change the qualitative results, but the adjusted R^2 for the OLS model increased to .789.

† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

quate dispersion, and no severe outliers were detected. As mentioned above, the correlations confirm the potential for multicollinearity between capital intensity and environmental growth and between market power and complexity of vertical integration. As expected, the correlations indicated a strong and significant negative association between the number of vertical links and Gort's measure of constrained vertical integration.

Table 1 also reports the correlations among the dependent variables used in the regression models. The two risk measures are modestly negatively correlated ($r = -.38$, $p < .10$). Since a low modified Z-score indicates high bankruptcy risk, and a high beta indicates high shareholder risk, the negative correlation suggested that, as expected, the two risks occur in tandem, but only to a limited degree.

Vertical Integration and Systematic Risk

Hypotheses 1 and 2 predict that complexity of vertical integration will have positive main and interactive effects on systematic (shareholder) risk. Table 2 shows the results from regressing beta on the independent and control variables. Vertical integration had no main effect, but shareholder risk and the interaction between vertical integration and environmental turbulence had a modest significant, positive ($p < .10$) association. The results of a hierarchical regression analysis indicated that, when added to the other variables in the model, the interaction term improved the overall R^2 by 0.06 ($p < .05$). We tested for multicollinearity between the main effect and the interaction term by dropping variables from the model. The results indicated that multicollinearity was not a problem. Thus, Hypothesis 2 was supported, but Hypothesis 1 was not.

Vertical Integration and Bankruptcy Risk

Hypotheses 3 and 4 predict significant main and interaction effects between complexity of vertical integration and bankruptcy (creditor) risk. Table 3 shows the results from regressing the modified Z-score on the independent variables. The main effect of vertical integration was not significant, but there was a significant ($p < .05$), negative relationship between creditor risk and the interaction of vertical integration and environmental turbulence. Since a low modified Z indicated high creditor risk, the negative relationship indicated that this risk was highest when complex patterns of vertical integration existed in turbulent environments.

The results of a hierarchical regression analysis indicated that the interaction term improved the overall R^2 by 0.06 ($p < .05$). Tests for multicollinearity indicated that it was not a problem. Thus, Hypothesis 4 was supported, but Hypothesis 3 was not.

Environmental Issues Affecting Risk

Hypothesis 5 predicts that high systematic and bankruptcy risk will be associated with high environmental turbulence, measured as average industry profit volatility, and a low environmental growth rate. Tables 2 and 3 also report the results of the tests of this hypothesis. The regression analysis results indicate that high systematic risk was significantly associated with high environmental turbulence ($p < .05$) but was not associated with environmental growth. In contrast, high bankruptcy risk (a low modified Z) was significantly associated with low environmental growth ($p < .01$) but was not significantly associated with environmental turbulence. Thus, Hypothesis 5 was only partially supported. Aspects of the environment that affected bankruptcy risk did not affect systematic risk, and vice versa.

Control Variables

High bankruptcy risk was significantly associated with high financial leverage ($p < .05$). Surprisingly, high bankruptcy risk was also associated with low asset specificity ($p < .10$) and a high proportion of sales in retailing ($p < .01$). Also surprisingly, the regression results indicated that market power was not associated with either systematic or bankruptcy risk. The reason for this finding may be extreme fragmentation in the forest products industry: the maximum weighted market share for the studied firms was 7.135 percent, so even the largest firms may not have had enough market power to reduce their risk.

DISCUSSIONS AND CONCLUSIONS

The most important finding of this study is that fully integrated firms—those with many vertical linkages and wide diversification throughout the value-added chain—tended to be associated with high bankruptcy and systematic risk when their environments were turbulent. The results are consistent with Hypotheses 2 and 4, which propose that the complexity of a firm's pattern of vertical integration will be associated with high risk in turbulent environments because the firm cannot adapt to environmental changes. Our risk–vertical integration finding is important because it suggests that recent warnings by strategists (e.g., Barreyre, 1988; Harrigan, 1985b; Quinn et al., 1990) about vertical integration may be warranted.

These results appear to be at odds with those of earlier studies of the oil industry asserting that vertical integration reduced risk. However, differences in the contexts studied might account for the differences in the two sets of results. The oil studies of the 1970s addressed a noncompetitive, highly concentrated industry in which raw material discontinuities occurred. Vertical integration might reduce risk under such circumstances, but it might raise risk under the type of turbulence captured by our measure of turbulence (variance in industry profitability). During the mid-1980s, fluctuations in demand for intermediate and end products and shifts in industry structure—not input shortages—induced turbulence in the forest products industry (Globerman & Schwindt, 1986).

Our finding of a positive relationship between risk and vertical integration in turbulent environments therefore raises several questions about the previously found negative association. It would be interesting to know whether the discrepancy between our findings and the oil industry research findings is due to differences in time frames or in industries. On the one hand, vertical integration in oil may now be more risky than the studies of that industry during the energy crises of the 1970s revealed. On the other hand, differences in the structure of the oil and forest products industries may also explain the different results. Oil is an oligopolistic industry, but forest products is a fragmented, and therefore competitive, industry. Its higher competitiveness may make flexibility and adaptability more important in the forest products industry than they are in the oil industry. In addition, patterns of vertical integration in the oil industry may be less complex than they are in forest products. The lesser degree to which oil companies can integrate into end products may restrict complexity. Thus, the oil industry may not have offered researchers the opportunity to examine the complex patterns of vertical diversification observed in this study. Knowing the answers to these questions about the industry and temporal issues affecting the relationship between vertical integration and risk would help to establish the generalizability of our findings.

Our finding of a positive risk–vertical integration relationship in turbulent environments also raises several interesting questions about the previous merger research that found a negative association between the two. The merger studies may have revealed differing results from those of this study for various reasons. First, merger studies may measure the market's initial overestimation of the long-run advantages of vertical synergies. The effectiveness of mergers is often low in the long run (Porter, 1987; Ravenscraft & Scherer, 1987), especially when competitive conditions change unexpectedly after a merger and the firms are locked into outmoded vertical integration strategies (Harrigan, 1985b). Second, although our results imply that changes in overall patterns of vertical integration increase risk, we can not assert that all vertical mergers increase risk. Some vertical mergers do not materially change the overall patterns of firms' vertical integration. Other vertical mergers may diversify firms from high-risk product lines into low-risk lines. Still another explanation is that the fully integrated firms we studied would be even more risky if they were not fully integrated. Answers to these questions must await research on data suitable for testing such alternative explanations.

In sum, the findings of this study indicate that complex patterns of vertical integration are associated with high risk in turbulent product-market environments. However, the small number of firms we studied limits the generalizability of our findings. In addition, although we hypothesized that the positive vertical integration–risk relationship is the result of firms' inability to adapt to turbulence, the results only demonstrated the existence of this relationship in turbulent environments. We have not investigated underlying causes. Future research should investigate whether integrated firms engage in fewer or more maladaptive strategic changes than nonintegrated firms and whether the former suffer from more coordination inefficiencies than the latter.

Nevertheless, this is the first study finding a positive relationship between risk and vertical integration based on a systematic study of quantified data. As such, it provides important insights into issues affecting the generalizability of previous studies on risk and vertical integration. In addition, this study has two other findings of importance: (1) environmental growth is associated with low bankruptcy risk but not with low systematic risk, and (2) environmental turbulence is associated with high systematic risk but not with high bankruptcy risk. These findings are important because they suggest that the judicious choice of product environments might have different effects on the risks of various stakeholders. Strategists have not investigated the possibility of shifting risk from one stakeholder to another through diversification strategy; such investigation offers an opportunity to extend multiple stakeholder models (e.g., Freeman, 1984) to corporate-level strategy.

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APPENDIX A
The Forest Products Value-Added Chain[a]

Development

We started with timber and traced the chain forward to all four-digit SIC codes that were part of five stages of production: one extraction stage, three manufacturing stages (processed raw materials, finished materials, and finished composite goods), and one distribution stage. These stages extend across two segments of the chain, wood and paper products. We did not look at integration into the manufacturing of equipment used at various stages of production because only two firms in the industry had such integration.

Within each stage of production, we identified one or more product groups by grouping four-digit SIC codes by the degree to which they employ similar inputs, sell outputs to similar users, and make those outputs using similar technological processes.

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[a] Figure 2 depicts the value-added chain.

Technologically feasible transfers between product groups were identified by identifying inputs that are outputs or by-products of other product groups. In the diagram, the arrows represent such transfers. In some cases, transfers skip stages; for instance, lumber goes to lumberyards. In other cases, interstage transfers are also shown; for instance, by-products of lumber mills, like wood chips, are used in pulp mill processes.

Description

The sequence begins with forest management, including logging operations. At the next stage of production, high-quality timber is sent to lumber mills and plywood-veneer mills. Lumber and plywood milling involve different technological processes. Lumber milling is basically a saw-milling process, but plywood-veneer involves pressing and gluing wood shavings or thin panels into particle boards, and so forth. Milling by-products, such as wood shavings, are sent to pulp mills. Milling outputs can be sold directly to the public. They may also be used to produce (1) wood boxes, pallets, and other products for industrial uses, and (2) building materials. These products may be sold directly to the public or used to build furniture, mobile homes, boats, houses. These products may also be distributed through retail outlets, such as furniture stores, or wholesale outlets, such as lumberyards, that also carry items manufactured by competitors.

Low-quality timber is sent to pulp mills, which produce a wet cellulosic product that can be disaggregated into cellulosic fibers and woven into a fibrous fabric that is molded into various forms. Pulp mills also produce gum- and wood-based chemical by-products. However, most of a pulp mill's wet cellulosic output goes to paper mills and paperboard mills. Paper mills use a mechanical pulping process that produces newsprint for large-scale printing and publishing concerns. This process also produces low-quality paper that can be used for converted paper products such as paper cups, paper towels, and low-quality writing paper.

Paperboard mills use a chemical pulping process that produces kraft paper and fine paper. Kraft paper can be further processed into containers using special equipment for cardboard box manufacturing. Fine paper can be processed into printed paper, fine stationery, greeting cards, and so forth, by simple mechanical (folding and cutting) and printing processes. Such products may be sold in specialty and stationery stores serving retail or commercial customers or distributed to large retailers, drug stores, and supermarkets.

APPENDIX B

An Illustration of Gort's Measure of Vertical Constraint and the Number of Vertical Links for a Sample Company

Figure 3 displays the pattern of vertically linked activities of Champion International, as reported in Trinet for 1985. On the basis of sales within each product group, Champion's core product group was paper mills. Gort's measure was the sum of the sales engaged in two downstream product groups (converted paper and stationery stores) and two upstream product groups (pulp and forestry) divided by noncore sales. Noncore sales were the total sales for the company less the sales in the core product group (paper mills).

This measure identifies the percentage of noncore sales that are in product groups adjacent to the core product group or adjacent to those product groups. Thus, the numerator of this measure excluded all aspects of Champion's vertical integration (in lumber, wood boxes, plywood, etc.) that are not vertically constrained to Champion's core product group. Because of Champion's wide breadth, it received a relatively low Gort score, indicating that it was not tightly constrained.

Champion's number of vertical linkages was calculated by counting the number of arrows in the diagram other than those representing the transfer of by-products. There were 15 vertical links, a relatively high number.

We computed the overall scale measuring the complexity inherent in Champion's pattern of vertical diversification by subtracting the Gort measure from the number of links after standardizing the measures to remove differences in the units of measurement. As expected, this yielded a relatively high score, indicating high complexity. The high score resulted from subtracting the low value on the Gort measure due to the large sales of products not adjacent to the firm's core product group from the relatively high number of vertical links in the portfolio.

In contrast, a single-product firm would have no links and a Gort score of one and would be rated lower on complexity than Champion because its low number of links and high degree of constraint would yield a low complexity score after the subtraction.

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RESEARCH NOTES

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DISTRIBUTIVE AND PROCEDURAL JUSTICE AS PREDICTORS OF SATISFACTION WITH PERSONAL AND ORGANIZATIONAL OUTCOMES

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Distributive justice was found to be a more important predictor of two personal outcomes, pay satisfaction and job satisfaction, than procedural justice, whereas the reverse was true for two organizational outcomes—organizational commitment and subordinate's evaluation of supervisor. However, procedural and distributive justice also interacted in predicting organizational outcomes. We discuss limitations of this study and directions for future research.

Folger and Konovsky captured the key distinction regarding justice in work organizations, noting that "distributive justice refers to the perceived fairness of the amounts of compensation employees receive; procedural justice refers to the perceived fairness of the means used to determine those amounts" (1989: 115). However, few studies have examined how both distributive and procedural justice affect outcomes (e.g., Folger & Konovsky, 1989; Greenberg, 1987a; Konovsky, Folger, & Cropanzano, 1987). In addition, most research has focused on legal rather than work-related issues. For example, Greenberg and Folger (1983) showed that defendants viewed trial verdicts (distributions) positively if they were seen as the result of fair procedures, an effect called the "fair process effect" (cf. Musante, Gilbert, & Thibaut, 1983). Folger and Konovsky pointed out that this research has suggested different predictive roles for procedural and distributive justice. In particular, studies have found distributive justice to predict satisfaction with specific, personal outcomes, like case verdicts, better than procedural justice. The reverse is true, however, when people make more general evaluations of, for instance, legal institutions or their representatives (Lind & Tyler, 1988).

In fact, the few studies that have been done in organizational settings have tended to support the notion that the predictive roles of procedural and distributive justice depend, at least in part, on the nature of the outcome in question. For example, Alexander and Ruderman (1987) found procedural justice accounted for more variance in management evaluations, job satisfaction, and perceived conflict than distributive justice. Konovsky and colleagues (1987) found that procedural justice predicted organizational commitment, but not pay satisfaction, whereas the reverse was true for distributive justice. Similarly, Folger and Konovsky (1989) found that procedural justice accounted for more variance in organizational commitment and trust in a supervisor than distributive justice, whereas the reverse was true for satisfaction with a pay raise.

Overall, these results suggest that procedural justice may be a more important predictor than distributive justice of outcomes related to evaluating a company as an institution and its representatives, such as organizational commitment and trust in supervisor. In contrast, distributive justice may be a more important predictor of personal outcomes, like satisfaction with pay level, than procedural justice.

Interestingly, these results reflect what we might call a main effect approach to examining the predictive roles of distributive and procedural justice in field research. There are few studies of the interactive effects of the two types of justice. In fact, the existing research evidence about interactive effects comes from laboratory studies. For example, in a recent investigation by Greenberg (1987a), subjects worked on a task in which distributive justice (pay levels) and procedural justice (how pay levels were determined) were manipulated. He found an interaction of the following form; subjects saw high pay levels as fair regardless of procedures but saw low pay levels as fair only when fair procedures were used. Perceptions of unfair treatment were maximized when pay was low and procedures were unfair. Similarly, in a laboratory study, Cropanzano and Folger (1989) found that resentment was highest when subjects perceived that unfair procedures prevented them from receiving high rewards for task performance.

Both Greenberg (1987a) and Cropanzano and Folger (1989) pointed out, however, that research was needed to determine whether these laboratory interactions generalize to organizational settings. An attempt at such generalization was the focus of our research. Another key research question was whether existing theory allows for a precise prediction regarding the form such interactions may take. We used referent cognitions theory (Folger, 1986) to derive just such a prediction.

Briefly, according to referent cognitions theory, individuals evaluate their work experiences by reflecting on "what might have been" under different circumstances and conditions (Folger, 1986). One way employees might accomplish such a comparison would be to cognitively simulate how their current work situation might be different had their organization used fairer procedures. In fact, Cropanzano and Folger (1989) suggested that referent cognitions theory offers a potential conceptual framework for the interactive effects of distributive and procedural justice.

They argued that the theory predicts that resentment should be maximized in organizations when outcomes are poor—distributive justice is low—and the procedures used by a decision maker, like a supervisor, are unfair. In effect, referent cognitions theory suggests that employees will contrast this situation to the more positive outcomes that they would have obtained had the decision maker used fair allocation procedures. On the other hand, referent cognitions theory predicts that when people perceive procedures to be fair, resentment will be minimal, even when distributive justice is low. Under such conditions, it would be more difficult for employees to envision alternative fairer procedures that could have led to better outcomes.

To test this interaction pattern in a field setting, we surveyed a group of bank employees. In addition to measuring procedural and distributive justice, we assessed perceptions of two important personal outcomes, pay and job satisfaction, and two organizational outcomes: organizational commitment and subordinate's evaluation of supervisor. If Cropanzano and Folger's (1989) application of referent cognitions theory is correct, we would expect that the evaluation of these outcomes would be most negative when both distributive and procedural justice are low. But we would expect positive evaluations when procedural justice is high, regardless of the level of distributive justice.

A more speculative prediction is that the interaction pattern referent cognitions theory suggests will be clearest when the focus is on organizational, as opposed to personal, outcomes. Because the former focus on the sources of the procedures that affect employees, such as supervisors and the employing organization as an institution, they provide a clearer target for retaliation than outcomes of a more personal nature. In other words, allowing employees to evaluate an organization as an institution gives them the opportunity to blame the parties responsible for creating the rules of the game—the unfair procedures—that have resulted in a lack of distributive justice. Referent cognitions theory suggests that employees' resentment is not only a function of low distributive justice, but also of the opportunity to blame "misfortune" on the actions of others rather than on their own behavior (Cropanzano & Folger, 1989).

Finally, should the interactions we predicted fail to materialize, we determined that our focus would shift to the interpretation of main effects. In view of prior research (e.g., Alexander & Ruderman, 1987), we predicted that distributive and procedural justice would each produce strong main effects for a variety of outcomes. Given Folger and Konovsky's (1989) and Konovsky and colleagues' (1987) results, however, we expected procedural justice to produce a stronger main effect in predicting organizational outcomes than distributive justice. We expected the reverse to be true with personal outcomes.

METHODS

Respondents

Surveys were distributed to 1,100 employees of a midwestern bank and completed on company time. Completed surveys were returned anonymously in sealed envelopes. In total, 675 employees completed the survey, resulting in a response rate of 61 percent. The respondents' mean age was 33.8 years (s.d. = 12.1); their mean company tenure was 6.3 years (s.d. = 5.8); and 74 percent were women. These respondent demographics compared favorably with company statistics for the work force as whole, suggesting that problems resulting from response bias were unlikely to be a major threat. In the total work force, 68 percent of the employees were women, with an average age of 34.6 years and an average company tenure of 6.9 years.

Measures

Predictors were measures of global distributive and procedural justice. Criterion variables were two measures reflecting evaluations of the surveyed organization and its representatives and two measures of satisfaction with personal outcomes.

Distributive justice. We used five of the six items from Price and Mueller's (1986) Distributive Justice Index. These items ask workers to indicate the extent to which they have been fairly rewarded in view of their responsibilities, experience, job stress, effort, and performance. Rewards in the index are defined broadly, with money, praise, and recognition all being listed as examples. An example of the item format is as follows: "How fair has [company name] been in rewarding you when you consider the amount of effort that you put into your work?" (1 = very unfair, 5 = very fair).

Procedural justice. We constructed a four-item procedural justice scale that used the same basic format and five-point response scale as the Distributive Justice Index. Respondents indicated the extent to which the general procedures used to communicate performance feedback, determine pay increases, and evaluate performance and promotability were fair.

Organizational outcomes. *Organizational commitment* was assessed using four items from Cook and Wall's (1980) commitment scale. These items ask workers to express their agreement or disagreement with various statements (e.g., "I feel myself to be a part of this company"), using five-point scales (1 = strongly disagree, 5 = strongly agree). The second organizational outcome, *subordinate's evaluation of supervisor*, was assessed with a single item: "Overall, I think my boss is a poor performer" (1 = strongly agree, 5 = strongly disagree). Several national probability studies (e.g, Quinn & Staines, 1979) have previously used an essentially equivalent item.

Personal outcomes. We used three items to assess *pay level satisfaction*. Two of the items used five-point agree-disagree formats; these were: "The pay for my job is excellent" and "I am satisfied with my current pay." The third item asked respondents "how they felt" about their pay (7 = delighted, 1 = terrible; cf. Andrews & Withey, 1976). Since they had different measurement scales, we standardized these three items before combining them.

We assessed the second personal outcome, *job satisfaction*, using the five-item scale developed for the Quality of Employment Surveys (Quinn & Staines, 1979). The items ask about general reactions to a job, such as, "All in all, how satisfied would you say you are with your job?"

RESULTS

Descriptive Statistics

Table 1 presents means, correlations, and reliability coefficients, where applicable, for all study variables. The reliabilities for multi-item scales were generally very good, with alphas ranging from .75 to .92. One concern that might be raised, however, is the correlation between procedural and distributive justice (.67). To help allay this concern, we would make three points. First, prior research has successfully shown that these scales predict different dependent measures, suggesting that they are independent constructs. Second, prominent researchers have claimed that although they are separate constructs, in practice a sizable correlation should be found between them (e.g., Folger, 1987). For example, Folger cited an important study by Tyler (1984) in which the correlation between distributive and procedural justice was .77. Third, we conducted an empirical analysis that sheds some additional light on this issue.[1]

Regression Analysis Results

Separate three-step, hierarchical regression analyses were performed for each outcome variable. At step 1, we entered five control variables: salary, job type, age, gender, and tenure. Staines, Pottick, and Fudge (1986) cautioned that these types of variables need to be controlled for, given their general potential to inflate or suppress relations between other variables. Salary and job type were of special concern, given their potential to affect the particular outcome variables used in this study.

As Table 2 shows, age significantly predicted pay level satisfaction, job satisfaction, and organizational commitment. Consistent with earlier research findings (Weaver, 1980), our finding was that older workers tended to have higher commitment and satisfaction than younger workers. Job type also significantly predicted job satisfaction, evaluation of supervisor, and organizational commitment, with managers being more positive than clerical employees.

At step 2, distributive and procedural justice were entered. Both types of justice were significant predictors of each outcome variable. Consistent with Folger and Konovsky's (1989) contentions, however, distributive justice

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[1] Podsakoff and Organ (1986) reviewed techniques that address method variance, including a procedure called the single factor approach. The logic of this approach is that if method variance accounts for the relations between two or more variables, a factor analysis should yield a single global (method) factor. Since researchers have generally viewed this approach as weak but as possibly providing some useful information, we combined it with a stronger confirmatory factor analysis, using LISREL VI (Jöreskog & Sörbom, 1985), which tests models that increase in complexity. The least complex model examined, the single factor model, did not fit the data as well as more complex models; the six-factor model with independent variables for procedural and distributive justice and our four dependent variables fit the data significantly better than all other models tested (Bentler-Bonett index = .927 [Bentler & Bonett, 1980]; Tucker-Lewis index = .933 [Tucker & Lewis, 1973]).

TABLE 1
Correlations and Descriptive Statistics for All Variables[a]

Variables[b]	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11
1. Job type	1.18	0.39											
2. Salary	15,334.00	11,201.00	.42										
3. Gender	1.75	0.43	−.21	−.21									
4. Age	33.55	11.35	.01	.02	−.21								
5. Job tenure	6.44	6.10	.07	.10	.00	.51							
6. Pay level satisfaction	0.00	2.82	.09	.05	−.08	.18	.11	(.85)					
7. Job satisfaction	16.37	5.59	.17	.14	−.09	.29	.15	.42	(.84)				
8. Subordinate's evaluation of supervisor	3.57	1.18	−.15	.11	−.09	.05	.03	.17	.38				
9. Organizational commitment	13.86	3.11	.14	.14	−.12	.22	.11	.46	.59	.32	(.75)		
10. Procedural justice	11.88	3.06	.14	.06	−.11	.12	.01	.51	.43	.34	.53	(.82)	
11. Distributive justice	14.90	4.41	.07	.01	−.08	.20	.05	.63	.47	.30	.49	.67	(.92)

[a] Correlations greater than .06 are significant at $p < .05$. Reliability coefficients for multi-item scales are on the main diagonal.

[b] For job type, 1 = clerical and 2 = managerial. For gender, 1 = man and 2 = woman.

TABLE 2
Results of Hierarchical Regression Analyses

	Personal Outcomes		Organizational Outcomes	
Independent Variables	Pay Level Satisfaction	Job Satisfaction	Subordinate's Evaluation of Supervisor	Organizational Commitment
Step 1				
Tenure	.02	−.03	.00	−.02
Gender	−.02	.02	.05	−.03
Age	.16***	.31***	−.02	.23***
Salary	.00	.07	−.05	.08
Job type	.08	.15***	.12**	.10*
ΔR^2	.04***	.12***	.03**	.08***
Step 2				
Procedural justice	.14***	.18***	.23***	.34***
Distributive justice	.52***	.30***	.15**	.23***
ΔR^2	.37***	.18***	.11***	.26***
Step 3				
ΔR^2 for interaction of procedural and distributive justice	.00	.00	.01*	.01**
F	56.29***	32.68***	14.74***	42.19***
df	8,630	8,604	8,626	8,631

* $p < .05$
** $p < .01$
*** $p < .001$

tended to be a more important predictor of personal outcomes (pay and job satisfaction) than procedural justice. In addition, procedural justice was a more important predictor of both organizational outcomes than distributive justice (see Table 2).[2]

In step 3, we entered the interaction of distributive and procedural justice. As Table 2 shows, the interaction terms for both evaluation of supervisor and organizational commitment were significant. When plotted (cf. Cohen & Cohen, 1983), both outcomes yielded the same interaction pattern.

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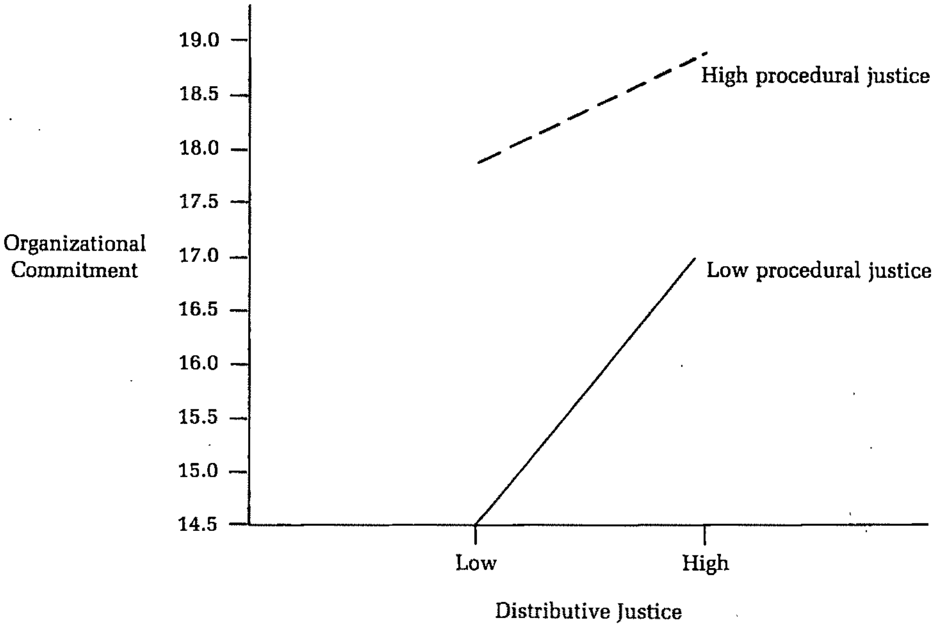
[2] Following a reviewer's suggestion, we conducted our regression analyses again, entering distributive and procedural justice on separate steps to more closely examine their relative predictive power. The results of these analyses were consistent with those given in Table 2; procedural justice was a stronger predictor of organizational outcomes than distributive justice, with the reverse being true for personal outcomes. Specifically, with procedural justice controlled, distributive justice accounted for an additional 5 percent of the variance in job satisfaction and 14 percent of the variance in pay level satisfaction; when the order of entry was reversed, procedural justice only accounted for an additional 1 and 2 percent for the two personal outcomes. With distributive justice controlled, procedural justice accounted for an additional 3 percent of the variance in supervisor evaluation and 6 percent of the variance in organizational commitment. When the order of entry was reversed, distributive justice only accounted for an additional 1 and 3 percent.

FIGURE 1
Interactive Effects of Distributive and Procedural Justice on Organizational Commitment



To illustrate this pattern, we present the interaction for organizational commitment in Figure 1, which shows that although employees who felt that procedures were fair tended to have higher levels of organizational commitment than those who felt procedures were unfair, this gap was much larger when distributive justice was low. Specifically, when procedural justice was low, organizational commitment varied considerably as a function of distributive justice. When procedural justice was high, however, organizational commitment varied little as a function of distributive justice. Again, an identical interaction pattern emerged for evaluation of supervisor.[3]

DISCUSSION

Distributive and Procedural Justice as Predictors

Our finding that both distributive and procedural justice are important predictors of work outcomes underscores recent admonitions for organizational researchers to examine both types of justice (Greenberg, 1987a,b). We also found, as expected, that distributive justice tended to be a stronger predictor of personal outcomes than procedural justice, whereas the reverse was true for organizational outcomes. The fairness of a firm's procedures may have a greater impact on organizational commitment than the fairness of personal outcomes that workers receive, perhaps because procedures define the organization's capacity to treat employees fairly. Thus, if they see procedures as fair, employees may view the organization positively, even if they are currently dissatisfied with such personal outcomes as a low pay raise. In contrast, a pay cut may cripple an employee financially, and a larger paycheck will buy more, regardless of whether procedures were fair or not (cf. Folger & Konovsky, 1989; Konovsky et al., 1987). Our findings are congruent with research in the legal arena that suggests that distributive and procedural justice have different predictive roles depending on whether the outcome in question is personal or reflects more general evaluations of legal institutions or their representatives (Lind & Tyler, 1988).

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[3] A reviewer raised a concern about the reliability of our single-item supervisor evaluation measure. To address this issue, we corrected the correlation matrix for measurement error and conducted the analysis again using the corrected matrix. Where possible, we used alpha coefficients for the correction. For the supervisor evaluation measure itself, we used test-retest correlations for a similar measure (cf. Quinn & Staines, 1979) as the reliability estimate. The interaction term was corrected for unreliability using procedures outlined by Borhnstedt and (continued)

However, we also found that distributive and procedural justice had significant interactive effects on our organizational outcomes, subordinate's evaluation of supervisor and organizational commitment. Consistent with Cropanzano and Folger's (1989) application of referent cognitions theory, these interactions revealed that the combination of unfair procedures and low distributive justice produced the lowest ratings. In contrast, fair procedures produced high commitment and supervisor evaluations, regardless of the level of distributive justice. Advocates of referent cognitions theory argued that, under conditions of procedural fairness, employees will find it difficult to envision that more positive alternative outcomes could have occurred.

Referent cognitions theory may also help explain why we found interaction effects for organizational, but not personal, outcomes. According to the theory, employee resentment requires not only low distributive justice, but also the ability to identify other people and the procedures that they use as the source of poor outcomes (Cropanzano & Folger, 1989). Thus, organizational outcomes may represent a clear target for blame, whereas personal outcomes do not. By definition, organizational outcomes make salient the institutional sources of the procedures that affect employees.

Limitations and Directions for Future Research

One of the most basic limitations of the present study is its exclusive reliance on cross-sectional, self-report data. This reliance precludes us from making strong causal statements about our results. The use of a longitudinal design would improve the ability to make causal statements. In addition, our

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Marwell (1978). The results yielded virtually the same effects as the original regression equation, including a significant interaction term.

approach raises the issue of common method variance. Although we can at least partially allay concerns about method variance in our particular case (see the Results section), we would also encourage future justice researchers to take steps to avoid method variance problems in field settings, by, for instance, collecting multiple measures.

Concern might also arise about the small magnitude of our interaction effects. Since interaction terms are not independent of main effects in regression analyses, Cohen and Cohen (1983) recommended that researchers test simple main effect models before entertaining more complicated interactive models. This procedure tends to underestimate the amount of variance for which interaction terms truly account. Furthermore, the literature on regression analysis provides several cautions about interpreting the theoretical or practical significance of interaction terms on the basis of the proportions of variance explained (cf. Champoux & Peters, 1987; Pedhazur, 1982; Stone & Hollenbeck, 1984). Apparently, a key issue is not how much variance is explained, but whether the increment is statistically significant, indicating that the relationship in question is being moderated. However, to understand the actual nature of an interaction effect, researchers should plot separate regression equations for different values of the moderator variable and examine the resulting pattern for its theoretical or practical significance (Stone & Hollenbeck, 1984). This is the approach we took in this research. Still, we would suggest that researchers be sensitive to the limitations of moderated regression analysis and follow the recommendations that have been made to minimize them.

Finally, a basic direction for future research is to determine whether personal and organizational outcomes other than those examined here and in previous research will yield similar predictive patterns for distributive and procedural justice. More research is also needed to explain why distributive and procedural justice may differentially affect personal and organizational outcomes. To address this issue may require a better understanding of *how* personal and organizational outcomes differ. As Cropanzano and Folger (1989) suggested, referent cognitions theory may provide a useful guiding framework for such efforts.

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CONSEQUENCES FOR MANAGERS OF USING SINGLE INFLUENCE TACTICS AND COMBINATIONS OF TACTICS

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The study involved analyses of incidents described from the perspective of the targets of influence attempts. We coded influence behavior in the incidents into nine tactics and classified outcomes as commitment, compliance, or resistance. Hypotheses were developed to explain the outcome of each tactic used alone and in combination. The findings supported most of the hypotheses. The most effective tactics were inspirational appeals and consultation. The least effective were pressure, legitimating, and coalition tactics. Intermediate in effectiveness were rational persuasion, ingratiation, personal appeals, and exchange tactics. "Hard" tactics were generally less effective than "soft" tactics. The outcomes of tactic combinations depended mostly on the potency of the component tactics.

One of the most important determinants of managerial effectiveness is success in influencing people (Bass, 1990; Yukl, 1989). Influence processes are important for understanding how managers motivate subordinates' commitment and extra effort (Bass, 1985), how decisions are made in organizations (Pfeffer, 1981), whether strategies and policies are implemented successfully (Bass, 1985; Conger, 1989), how managers obtain cooperation and support from lateral peers over whom they have no authority (Cohen & Bradford, 1989; Kotter, 1982), how managers influence superiors to provide necessary support and resources (Gabarro, 1979), and why organizations adopt some innovations but reject others (Kanter, 1983). Despite the obvious importance of this subject, there has not been much empirical research on the influence behavior of managers. Several studies have examined such issues as the types of influence tactics managers use and the objectives of their influence attempts (e.g., Erez, Rim, & Keider, 1986; Kipnis, Schmidt, & Wilkinson, 1980; Yukl & Falbe, 1990). However, only six studies have examined how influence tactics affect attitudes and behavior (Case, Dosier, Murkinson, & Keys, 1988; Dosier, Case, & Keys, 1988; Keys, Case, Miller, Curran, & Jones, 1987; Kipnis & Schmidt, 1988; Mowday, 1978).

Overall, the six studies provide little insight into the relative effectiveness of different tactics in influencing subordinates, peers, and superiors. Few findings have been significant, and the significant results have mostly been inconsistent across studies. The absence of strong and consistent findings may be due to a number of reasons. Methodological differences among the studies are substantial, with tactics and their outcomes measured in different ways from one study to the next. Some studies have compared the tactics used in successful and unsuccessful influence incidents, whereas other studies have examined correlations between questionnaire measures of tactics and measures of managerial performance. None of the correlational studies has used an immediate outcome, such as the task commitment of the target of the influence behavior under study. Influence behavior is likely to affect such an immediate outcome more than a criterion like ratings of the overall performance of the influence agent. The influence incident studies have used immediate outcomes as criteria but measured them in terms of a simple dichotomy (successful versus unsuccessful), which reduces the likelihood of finding any effect of influence tactics on the outcomes. Finally, most of the studies have examined only upward influence attempts, in which agent influence is likely to be weaker than it would be in lateral or downward influence attempts.

Almost nothing is known about the way agents combine different tactics in the same influence attempt or about the effectiveness of different combinations. It is extremely difficult to investigate this subject in questionnaire studies. For example, a study by Kipnis and Schmidt (1988) indicated the tactics managers emphasized but did not examine tactic sequences or combinations. Tactic combinations can be studied more directly with influence incidents than with questionnaires, but this has not been a research objective in prior incident studies (Case et al., 1988). We conducted the present research to learn more about the likely outcomes of using different influence tactics alone and in various combinations. The next section defines the influence tactics and outcomes studied and presents hypotheses about the effects of tactics on outcomes, along with a brief review of relevant prior research.

CONSTRUCTS AND HYPOTHESES

Outcomes of Influence Attempts

Influence attempts result in various outcomes that can be differentiated in terms of agent success. Prior critical incident studies have used only a dichotomous classification of outcomes (successful versus unsuccessful), but the effectiveness of an influence attempt can be evaluated more precisely by distinguishing between three different outcomes: commitment, compliance, and resistance (Yukl, 1989). Commitment occurs when a target person agrees internally with an action or decision, is enthusiastic about it, and is likely to exercise initiative and demonstrate unusual effort and persistence in order to carry out the request successfully. Compliance occurs when the target person carries out the requested action but is apathetic about it rather than enthusiastic, makes only a minimal or average effort, and does not show any initiative. The distinction between compliance and commitment is similar to Kelman's (1958) distinction between compliance and internalization. Resistance occurs when the target person is opposed to the requested action and tries to avoid doing it by refusing, arguing, delaying, or seeking to have the request nullified.

The success of an influence attempt depends on the nature of the request as well as on the immediate outcome. Attitudinal commitment is a more successful outcome than behavioral compliance for a complex task that requires extra effort, initiative, and persistence to be performed effectively. Under these conditions, compliance is less successful than commitment but is still preferable to resistance. For a request that is simple and routine (e.g., wear safety goggles, perform a simple, short task), compliance may be all that is needed to accomplish an agent's objective. In this situation, compliance may be regarded as a successful outcome, but in many cases an agent can obtain compliance by making a simple request (Yukl, 1990).

Effectiveness of Individual Tactics

The outcome of an influence attempt depends on several variables, including the type of tactic used, the objective of the influence attempt, the relative power of an agent and a target, their relationship, the agent's skill in exercising power, and the target's prior attitudes and perceptions about the requested action. In light of the large number of causal variables and the inconsistent results of prior studies, it is difficult to develop hypotheses about the likely outcomes of individual tactics. Nevertheless, the few prior studies on this question, and indirect evidence from research on leadership, motivation, attitude change, and conflict resolution, suggest that some tactics are more likely than others to result in successful outcomes. The relative effectiveness of the tactics stems in part from their intrinsic properties and in part from the types of requests for which they are likely to be used.

The present research included nine influence tactics that cover the full range of observable, proactive influence behaviors examined in prior research on managers in organizations. The construct validity of the tactics is based in part on the results of factor analyses of data from self-report agent questionnaires (Schriesheim & Hinkin, 1990) and target questionnaires (Yukl, Lepsinger, & Lucia, 1992). The following hypotheses describe the likely outcome for each of the nine tactics.

> *Hypothesis 1: Inspirational appeals are more likely to result in commitment than in compliance or resistance.*

In an inspirational appeal, an agent makes a request or proposal that arouses enthusiasm by appealing to a target's values, ideals, and aspirations, or by increasing the target's confidence that he or she can do the requested task. Research on the downward influence of leaders over subordinates provides indirect evidence about the likely effectiveness of inspirational appeals. Descriptive studies of "charismatic" and "transformational" leadership (Bass, 1985; Conger, 1989) have found that managers who motivate exceptional effort by subordinates present a clear, inspiring vision, which is one form of inspirational appeal.

> *Hypothesis 2: Consultation is more likely to result in commitment than in compliance or resistance.*

With consultation, an agent seeks a target's participation in planning a strategy, activity, or change for which the target's support and assistance are desired, or the agent is willing to modify a proposal to deal with the target's concerns and suggestions. Consultation increases commitment when the target develops a more favorable attitude than was present formerly about the task and feels a sense of ownership for it as a result of participating in planning it. Most results pertinent to this issue from prior research have been either positive or nonsignificant. Schilit and Locke (1982) found that a consultation tactic—using a target as a platform to present ideas—was likely to be effective in upward influence incidents reported by targets, but the results for upward influence incidents reported by agents were not significant in that study, nor were they in the incident studies by Case and colleagues (1988) and Dosier and colleagues (1988). Leadership research on the use of consultation with individual subordinates has found that consultation increases decision acceptance in some situations but not in others (cf. Vroom & Jago, 1988).

> *Hypothesis 3: Rational persuasion is more likely to result in compliance or commitment than in resistance.*

With rational persuasion, an agent uses logical arguments and factual evidence to persuade a target that a proposal or request is worthwhile. Rational persuasion is most likely to be effective when the agent and target share a common task objective (Yukl, 1990). Results from prior research on the consequences of using rational persuasion have been either positive or nonsignificant. In the questionnaire study by Kipnis and Schmidt (1988), managers who used rational persuasion more than other tactics in upward influence attempts received the highest performance ratings. Rational persuasion was not related to successful upward influence in the questionnaire study by Mowday (1978), and it was not related to outcome success in the four critical incident studies described earlier.

> *Hypothesis 4: Ingratiation is more likely to result in compliance than in commitment or resistance.*

With ingratiation, an agent seeks to get a target in a good mood or to think favorably of him or her before making a request. The agent attempts to increase target cooperation by increasing the target's feelings of positive regard toward him or her (Liden & Mitchell, 1988). The findings of research on the consequences of ingratiation used as a direct influence tactic have been few and inconsistent. In their questionnaire study of upward influence, Kipnis and Schmidt (1988) found that male managers whose influence profile involved a relatively high use of ingratiation received moderate performance ratings, but female ingratiators received high performance ratings. Keys and colleagues' (1987) results were not significant for ingratiation tactics (courtesy or friendliness) used in lateral incidents.

> *Hypothesis 5: Personal appeals are more likely to result in compliance than in commitment or resistance.*

With a personal appeal, the agent appeals to the target's feelings of loyalty and friendship to influence the target to do something unusual or extra as a special favor. Only three studies have examined the effectiveness of personal appeals as an influence tactic, and results were nonsignificant in every case. In the critical incident study by Schilit and Locke (1982), personal appeals (asking for favors or pity) were not related to success in upward influence attempts. Likewise, in the critical incidents study by Case and colleagues (1988), personal appeals (pleading, begging, and asking favors) were not related to the success of upward influence attempts. In the critical incidents study by Keys and colleagues (1987), personal appeals (appealing to the sympathy of the target) were not related to the success of lateral influence attempts.

> *Hypothesis 6: Exchange is more likely to result in compliance than in commitment or resistance.*

Exchange tactics involve explicit or implicit offers by an agent to provide a favor or benefit to a target in return for doing what the agent requests. The agent offers an exchange of favors, indicates willingness to reciprocate at a later time, or promises a share of the benefits if the target helps the agent do a task. An agent is most likely to use exchange when a target is reluctant to do what the agent wants without an additional inducement. An exchange of tangible benefits between a leader and a subordinate is an impersonal transaction that often results in compliance but is unlikely to result in subordinate commitment to the task (Bass, 1985; Yukl, 1989). Results for the consequences of using exchange as a direct influence tactic have been inconsistent. Schilit and Locke (1982) found that exchange (trading job-related benefits) was more likely to be successful than unsuccessful in upward critical incidents described by targets, but results for this tactic were not significant in upward incidents described by agents. No significant results for exchange tactics emerged in the incident studies by Case and colleagues (1988) and by Keys and colleagues (1987) or in the questionnaire study by Mowday (1978).

> *Hypothesis 7: Pressure is more likely to result in resistance or compliance than in commitment.*

With pressure tactics, an agent uses demands, threats, frequent checking, or persistent reminders in an attempt to influence a target to carry out a request. Pressure is unlikely to result in commitment except in the rare situation in which the target already has some prior reason to be committed to the agent's request or proposal, in which case pressure is inappropriate. In

Kipnis and Schmidt (1988), self-reported use of pressure was a key part of the behavior profile for managers who received the lowest performance ratings. In Schilit and Locke (1982), targets reported that some pressure tactics used in upward influence attempts (threatening to go over a target's head, challenging the power of the target) were likely to be unsuccessful, and agents reported that another pressure tactic (threatening to resign) was likely to be unsuccessful. In Case and colleagues (1988), an upward influence attempt was likely to be unsuccessful when the agent used a pressure tactic (telling or arguing without support). Pressure was not related to influence success in three other studies (Dosier et al., 1988; Keys et al., 1987; Mowday, 1978).

> *Hypothesis 8: Legitimating is more likely to result in resistance or compliance than in commitment.*

With legitimating tactics, an agent seeks to establish the legitimacy of a request by claiming the authority to make it or by verifying that it is consistent with organizational policies, rules, or traditions. Legitimating tactics may induce a target to comply with a request if the target is convinced the request is within the agent's scope of authority and is consistent with organizational rules and policies. Yukl and Falbe (1991) found that the reason reported most frequently by managers for complying with a request made by a superior or peer was the legitimacy of the request. However, there is little reason to expect legitimating tactics to result in task commitment, and this tactic may even evoke resistance if used in an arrogant manner (Yukl, 1989). Legitimating tactics were not related significantly to influence success in the incident studies by Schilit and Locke (1982) and Keys and colleagues (1987) or in the questionnaire study by Mowday (1978).

> *Hypothesis 9: Coalition is more likely to result in resistance or compliance than in commitment.*

With coalition tactics, an agent enlists the aid or endorsement of other people to influence a target to do what the agent wants. Most prior studies have indicated that coalition tactics are seldom effective for influencing target commitment. Coalition tactics (using group or peer support) were not significantly related to outcome success in the incident studies by Case and colleagues (1988), Dosier and colleagues (1988), and Schilit and Locke (1982). In the questionnaire study by Kipnis and Schmidt (1988), self-reported use of coalitions in upward influence was part of the profile for managers who received the lowest performance ratings. The only positive relationship for a coalition tactic (gaining the support of several peers) was found in the study of lateral influence incidents by Keys and colleagues (1987).

The following two hypotheses address the relative effectiveness of the nine influence tactics:

> *Hypothesis 10: Consultation and inspirational appeals are more effective than the other tactics.*

> *Hypothesis 11: Pressure, legitimating, and coalition are less effective than the other tactics.*

Effectiveness of Tactic Combinations

The large number of tactic combinations possible for a set of nine tactics makes it difficult to analyze results in critical incident research unless the tactics are first grouped into a smaller number of meta-categories. Kipnis and Schmidt (1985) suggested that influence tactics can be grouped into three categories—hard tactics, soft tactics, and rational persuasion—and recent studies have used these meta-categories to examine the relationship between a leader's influence behavior and other leader attributes (e.g., Deluga, 1991a, 1991b). Hard tactics involve use of authority and position power, and they tend to be used in an impersonal and manipulative way. Pressure and legitimating tactics are clearly hard tactics, and many forms of coalition are hard, especially upward appeals to an agent's superior. Kipnis and Schmidt included exchange as a rational tactic, but when used in an impersonal, manipulative way, exchange appears to be a hard tactic. Soft tactics involve use of personal power and power sharing. The soft tactics include ingratiation, consultation, inspirational appeals, and personal appeals.

As noted earlier, Case and colleagues (1988) found that more successful outcomes occurred for influence attempts with two tactics than for influence attempts with a single tactic, although their study did not examine the relative effectiveness of different tactic combinations. It is likely that the effectiveness of a tactic combination depends primarily on the potency of the component tactics. For example, it is likely that combining two soft tactics is more effective than combining a hard and soft tactic, or combining two hard tactics.

METHODS

Critical incidents were used to investigate the outcomes of influence attempts. In contrast to analysis based on questionnaires, analysis of individual influence attempts makes it possible to assess the effectiveness of each tactic used alone or in combinations.

Data Collection

Information on influence incidents was obtained from 95 night M.B.A. students at a large state university. The students worked in regular jobs during the day in a variety of large and small private companies and public agencies. Nearly half the students were managers, and most of the rest were nonmanagerial professionals. Eighty-five of the students each described 6 incidents as part of a course project in two M.B.A. courses, and 10 other students each obtained 18 incidents for an optional research project that was not part of a regular course. All incidents were reported from the perspective of the target of an influence attempt made by a subordinate, a peer, or a boss. Most of the students reported on their own experiences as targets, and the rest interviewed managers from their own or another organization. Respondents were assured that the information on incidents they gave would remain confidential and would not be seen by anybody except the researchers. Students were asked to obtain from each source (themselves or another person) equal numbers of incidents resulting in commitment, compliance, and resistance; we defined these outcomes for the students beforehand.

Students received forms on which to write descriptions of the incidents. The incident forms had fixed-response items that asked respondents to indicate the direction of the influence attempt described—whether the agent was a subordinate, peer, or boss—and the initial and final outcomes of the influence attempt: resistance, compliance, or commitment. The following instructions were provided for the descriptions of incidents to be written by respondents on the blank part of the form: "In a paragraph or two, describe what was said or done by the agent to influence you. Also, describe how you reacted to the request. If a sequence of influence attempts occurred, describe each episode in the sequence." Students were also instructed to provide details, including quotes and examples of what the agent said. We encouraged the students to obtain examples of influence attempts that involved important issues or substantive requests for assistance or support rather than simple requests or routine task assignments. We emphasized selection of nontrivial influence objectives to ensure that the students would provide the types of incidents for which commitment is more desirable than compliance and for which more than a simple request is necessary to ensure target commitment.

Coding of Incidents

Each influence behavior used by an agent in each incident was coded as one of the nine influence tactics described earlier in the hypotheses. To simplify the analysis of tactic combinations, we limited the number of tactics that could be coded in any single time period or phase of an incident to two. Few incidents involved more than two influence tactics at the same time, and for those incidents the two most salient tactics were selected. The coders also checked the respondents' classifications of outcomes and directions of influence to verify their consistency with the evidence provided in the incident.

Two people independently coded each incident. The coders were two management professors and two doctoral students. Whenever possible, one coder screened incidents, and if an incident was ambiguous, the information was returned to the person who had provided it for additional detail and clarification about what the agent said or did in the influence attempt. Likewise, if an incident description did not provide adequate justification for the outcome rating, the respondent was asked to explain in more detail. After a pair of coders had finished their independent coding of a set of incidents, they met to confer about them and resolve any disagreements. The level of agreement between coders in their independent coding of incidents was moderately high; the same tactic codes were assigned in 85 percent of the incidents. We discarded an incident if it was too ambiguous to allow resolution of coder disagreement, if it involved only a simple request, or if it involved multiple agents and targets in a complex interaction. The data analysis was based on the final codings made after agreement was reached.

A total of 646 usable incidents was obtained. In most of our analyses, we treated the initial and follow-up parts of sequential incidents as separate influence attempts, each with its own tactics and outcome. The 542 initial and 235 follow-up influence attempts provided a total of 777 influence attempts. The direction of the influence attempt was downward in 328 cases, lateral in 212 cases, and upward in 237 cases. Roughly half the targets in the downward and lateral incidents were nonmanagerial employees. All the targets in the upward influence attempts were managers. The distribution of outcomes for the 777 influence attempts was as follows: 287 (37%), resistance; 268 (34%), compliance; and 222 (29%), commitment; this distribution is close to the equal distribution we sought to obtain with our instructions to respondents.

RESULTS

The most direct way to evaluate the relative effectiveness of the nine influence tactics is to examine outcomes for influence attempts involving only a single tactic, since there will be no confounding of effects resulting from simultaneous use of another tactic. Table 1 shows the frequency of resistance, compliance, and commitment outcomes for each tactic when used alone, in initial influence attempts (345 incidents), or in follow-up influence attempts (159 incidents). We tested Hypotheses 1 through 9 with a chi-square test. Inspirational appeals and consultation both had a modal outcome of commitment, consistent with the predictions of Hypotheses 1 and 2. Contrary to Hypothesis 3, rational persuasion was as likely to result in resistance as in compliance or commitment. Legitimating tactics, coalitions, and pressure usually resulted in resistance or compliance, consistent with Hypotheses 7, 8, and 9. As expected, ingratiation, personal appeals, and exchange were intermediate in effectiveness and had a more equal distribution of outcomes. The outcome pattern was consistent with Hypothesis 4 but not with Hypotheses 5 and 6.

We assessed the relative effectiveness of the nine influence tactics by comparing them in terms of a continuous criterion of outcome success. Outcomes were coded as 1 for resistance, 2 for compliance, and 3 for commitment, reflecting increasing outcome success from the perspective of the agent for requests that require a degree of target enthusiasm and initiative to be carried out successfully. Table 1 shows the mean outcome for each tactic when used alone in initial or follow-up influence attempts. An analysis of variance indicated that some tactics had significantly more favorable outcomes than others ($F = 7.8$, $p < .01$, $df = 8,495$). Results of a Duncan's multiple range test indicated significant differences ($p < .05$) for many of the

TABLE 1
Outcomes for Each Tactic Used Alone

	Outcomes[a]							Summary of Pairwise Comparisons of Means[b]							
Influence Tactics	Resistance	Compliance	Commitment	Cases	Means	s.d.	χ^2	1	2	3	4	5	6	7	8
1. Inspiration	0%	10%	90%	10	2.9	.32	25.21**								
2. Consultation	18	27	55	11	2.4	.80	6.56*	ns							
3. Personal appeals	25	33	42	36	2.2	.81	8.24**	*	ns						
4. Exchange	24	41	35	34	2.1	.77	5.53*	*	ns	ns					
5. Ingratiation	41	28	31	32	1.9	.86	1.16	*	ns	ns	ns				
6. Rational persuasion	47	30	23	270	1.8	.80	1.77	*	*	*	*	ns			
7. Legitimating	44	56	0	16	1.6	.51	2.40	*	*	*	*	ns	ns		
8. Coalition	53	44	3	31	1.5	.57	3.77*	*	*	*	*	ns	ns	ns	
9. Pressure	56	41	3	64	1.5	.56	14.28**	*	*	*	*	*	*	ns	ns
Number of incidents	218	169	117	504											

[a] Percentages are based on row totals.

[b] Pairwise differences on Duncan's multiple range test are significant at $p < .05$; ns = nonsignificant.

* $p < .05$

** $p < .01$

pairwise comparisons (see Table 1). Inspirational appeals and consultation were significantly more effective than most of the other tactics, consistent with Hypothesis 10. Legitimating, coalition and pressure tactics were significantly less effective than most of the other tactics, consistent with Hypothesis 11.

The fact that more than two thirds of the incidents involved an initial influence attempt may somewhat bias the results for the analysis of tactics used alone. As a supplementary analysis, tactics used in the follow-up influence attempts were compared. For this analysis, the criterion was not the absolute outcome, but rather the degree of improvement in outcome over that of the initial influence attempt. Outcomes that did not change were coded as a 1; improvement from resistance to compliance or from compliance to commitment was coded as a 2; improvement from resistance to commitment was coded as a 3. Because the number of follow-up influence attempts was small, we made the analysis without regard to use of tactics alone (159 incidents) or in combination with another tactic (76 incidents). Thus, the data for this analysis consisted of 311 tactics, not 235 incidents. An analysis of variance indicated significant differences among tactics with respect to outcome improvement ($F = 7.7$, $p < .01$, $df = 8{,}302$). Results of a Duncan's multiple range test showed that there was significantly more improvement in outcomes ($p < .05$) for inspirational appeals, consultation, rational persuasion, and exchange than for pressure and coalition; the remaining three tactics were intermediate in effectiveness. Thus, even for follow-up influence attempts and a different type of criterion, the relative effectiveness of the nine tactics remained about the same. The most obvious difference between the two analyses occurred for rational persuasion, which moved up in the ranking of tactics. This difference arose because rational persuasion was more effective as a follow-up tactic ($\bar{x} = 2.2$) than as an initial tactic ($\bar{x} = 1.8$). In many initial influence attempts, agents used very weak forms of rational persuasion, whereas weak forms were seldom used in follow-up attempts.

Table 2 shows the outcomes for soft, hard, and rational tactics, and the possible pairwise combinations of these categories. We used an analysis of variance to compare the soft, hard, and rational tactics used alone (504 incidents) or in combinations (273 incidents). Results indicated that some combinations had significantly more favorable outcomes than others ($F = 15.3$, $p < .01$, $df = 7{,}769$).

As in the earlier study by Case and colleagues (1988), influence attempts in which an agent used a pair of tactics had more favorable outcomes ($t = 5.6$, $p < .01$) than incidents in which the agent used only a single tactic. However, results for comparison of different combinations using Duncan's multiple range test (see Table 2) indicated that the effectiveness of a combination depended on what types of tactics were combined. Combining two soft tactics was more effective than using a single soft tactic. Cell sizes were too small to allow analysis of results for specific pairs of tactics, but it is interesting to note one apparent exception to this generalization: the com-

TABLE 2
Outcomes for Major Types of Tactics Used Alone and in Combinations

	Outcomes[a]						Summary of Pairwise Comparisons of Means[b]						
Influence Tactics	Resistance	Compliance	Commitment	Cases	Means	s.d.	1	2	3	4	5	6	7
1. Soft with soft	14%	12%	74%	35	2.6	.74							
2. Soft with rational	14	31	55	73	2.4	.72	ns						
3. Soft alone	27	28	45	89	2.2	.83	*	ns					
4. Hard with rational	28	46	26	92	2.0	.74	*	*	ns				
5. Soft with hard	33	35	32	37	2.0	.82	*	*	ns	ns			
6. Rational alone	47	30	23	270	1.8	.80	*	*	*	*	ns		
7. Hard with hard	45	47	8	36	1.6	.64	*	*	*	*	*	ns	
8. Hard alone	47	43	10	145	1.6	.67	*	*	*	*	*	ns	ns
All combinations	25	36	39	273	2.1	.79							
All single tactics	43	34	23	504	1.8	.79							

[a] Percentages are based on row totals.

[b] Pairwise differences on Duncan's multiple range test are significant at $p < .05$; ns = nonsignificant.

bination of personal appeals with ingratiation appeared relatively ineffective ($\bar{x}$ = 1.7). Combining a soft tactic with rational persuasion was more effective than using a single soft tactic or rational persuasion alone. Combining a hard tactic with rational persuasion was more effective than using a single hard tactic or rational persuasion alone. Combining two hard tactics was not significantly different from using a single hard tactic. Combining a hard tactic with a soft tactic was more effective than using a single hard tactic but not significantly different from using a single soft tactic. Finally, combining two soft tactics was clearly more effective than combining two hard tactics.

DISCUSSION

Prior research has found only weak and inconsistent results for the effectiveness of different influence tactics. Our results revealed clear differences among tactics with respect to likely outcomes, and we found that some tactics were generally more effective than others. The most effective tactics were consultation and inspirational appeals, although these tactics were used mostly in a downward and lateral direction and usually in combination with another tactic. The effectiveness of rational persuasion depended to a great extent on how it was used. It was much more effective when used in combination with soft tactics such as consultation, inspirational appeals, or ingratiation than when used alone or with hard tactics such as pressure, coalitions, and legitimating. Ingratiation, personal appeals, and exchange were moderately effective tactics. Exchange was surprisingly effective, and it may not be appropriate to regard it as a hard tactic except when it is used in a very impersonal, manipulative way. The least effective tactics were pressure, coalition, and legitimating. These tactics seldom resulted in commitment, even when used with another tactic. Nevertheless, the results showed that these hard tactics can be useful for eliciting compliance, especially when combined with rational persuasion. As noted earlier, compliance is sometimes all that is needed to accomplish a task objective. Overall, the results are consistent with the proposition that each tactic can be useful in an appropriate situation (Yukl, 1990).

This was the first study to examine the relative effectiveness of different combinations of tactics. The results indicated that the effectiveness of a combination depends primarily on the potency of its component tactics. Combinations were usually more successful than single tactics, but a combination of two hard tactics was no better than a single hard tactic, and a soft-hard combination was no better than a single soft tactic. Thus, when managers use tactic combinations, they should pay careful attention to the selection of component tactics.

The research method used in this study has some limitations that should be acknowledged. Since we did not experimentally manipulate influence behavior in our research, we can only infer causality from the results. Any conclusions about the relative effectiveness of different tactics rest on the assumption that the results were not biased by confounding factors or sampling problems. For example, a manager's experience may be related to how effectively a particular influence tactic is used. Another limitation was the reliance upon targets to describe the influence behavior of agents. We used targets, because we believed they would provide a more accurate assessment of influence outcomes than agents. However, target reports tend to underrepresent some subtle forms of agent influence behavior that are successful only if the target is not aware they are being used, such as ingratiation and subtle forms of coalition. The ineffectiveness of coalition tactics in this study may be due to a high incidence of overt forms that appeared coercive to the targets.

The findings of our research have implications for improving managerial effectiveness, although caution is needed in offering guidelines until follow-up research verifies the present results. This study indicates that some tactics tend to be more effective than others, but it does not suggest that some tactics or combinations will always result in task commitment or that others will always result in resistance. Other variables besides the types of influence tactics an agent uses affect the outcome of any particular influence attempt, and any tactic can result in resistance if it is used in an unskillful manner or for a request that is illegitimate or unethical. Nevertheless, it is an advantage for a manager to know which tactics have the highest likelihood of success.

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A DERIVATION OF THE UNDERLYING CONSTRUCTS OF JUST-IN-TIME MANAGEMENT SYSTEMS

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Researchers have recommended that the theoretical constructs underlying just-in-time (JIT) management systems be identified and developed if JIT is to be fully understood and its full capabilities realized. In this study, we advanced this conceptual development through an instrument based on the relevant literature and empirically deriving three underlying constructs: (1) operating structure and control, (2) product scheduling, and (3) quality implementation. We report a content analysis of these constructs and develop propositions regarding their relationships, predecessors, and outcomes.

Recently, foreign manufacturers have gained a strong foothold in providing goods to selective markets once dominated by U.S. firms (Abernathy, Clark, & Kantrow, 1981). To regain their competitive edge, U.S. firms have focused on Japanese techniques, and in particular, just-in-time (JIT) manufacturing (Chapman & Carter, 1990; Hall, 1983; Hay, 1988; Im, 1989; Monden, 1983).

The management of JIT is based on two principles: (1) elimination of wastes and (2) respect for and full utilization of the capabilities of people (Automotive Industry Action Group [AIAG], 1983; Billesbach & Schniederjans, 1989; Finch, 1986; Klein, 1989). Many attempts have been made to define JIT as a set of ongoing programs, but these attempts have created problems for furthering the understanding of JIT (Heiko, 1989; Im, 1989). For example, to the Japanese, JIT is a manufacturing system in which all materials, people, and equipment are interrelated. In the United States, JIT is often viewed as a set of specific management programs (Hall, 1987) or as an inventory control system (Dean & Snell, 1991).

Several researchers have argued that JIT is not just a set of programs, but a management philosophy and, as such, in need of having its underlying theoretical constructs defined (e.g., Hall, 1987; Heiko, 1989; Im, 1989). Only with such definitions in place can academics and practitioners develop a holistic understanding of JIT. That understanding could be applied to advance theory, research, education, and implementation. The development of theory typically evolves through five steps (Schendel & Hoffer, 1979): (1) exploration, (2) construct development, (3) hypothesis generation, (4) hypothesis testing for internal validity, and (5) testing for external validity. This study, through a review of literature and an empirical derivation of constructs, addressed the first three steps in answering the question, What are the underlying constructs making up JIT? In this article, after construct derivation we propose a model of relationships among constructs, requisite inputs, and corresponding outcomes.

LITERATURE REVIEW

Just-in-time was developed in the Toyota Motor Corporation by line workers through continuous efforts to solve manufacturing problems (Monden, 1983; Walleigh, 1986). Many researchers have since positioned JIT as a philosophy with two major objectives: improving quality and providing timely production and delivery of products (Hahn, Pinto, & Bragg, 1983; Monden, 1983; Walleigh, 1986). Lower inventory and costs, better competitive performance, and long-run company success are potential outcomes of meeting those objectives (Finch, 1986; Golhar, Stamm, & Smith, 1990; Hall, 1983). This practical origin has led to definitions of JIT grounded in reality, specifically equating JIT with production programs or inventory management (Dean & Snell, 1991; Finch, 1986; Schonberger, 1986), but the conceptual foundations of JIT have not been established (Heiko, 1989; Im, 1989).

Programs Associated with JIT

The programs associated with JIT have not been universally identified, discussed, or implemented, but several have been consistently discussed in past research. Starting with the earliest practical and most cited literature on JIT systems in the United States (AIAG, 1983; Hall, 1983; Monden, 1983; Schonberger, 1982; Shingo, 1981), White and Ruch (1990) identified ten JIT programs for which a consensus existed. The ten programs are: focused factory, reduced set-up times, group technology, total preventive maintenance, multifunctional employees, uniform work loads, kanban, total quality control, quality circles, and JIT purchasing.[1] Further examination of the literature reveals two additional programs often associated with JIT: withdrawal of buffer inventory, and production strategy, or the reconciliation of customer needs and corporate strategy (cf. AIAG, 1983; Monden, 1983; Schonberger, 1982; Shingo, 1981). White and Ruch pointed out, however, that inventory reduction is implicit in implementing several of the programs, such as group technology and JIT purchasing. Other researchers have regarded inventory reduction as a benefit achieved from JIT implementation (Chapman & Carter, 1990; Hall, 1987; Mefford, 1989). Production strategy appears to be inherent in Skinner's (1974) focused factory program, in which a production system is geared to a small number and variety of products. The focused factory replaces a factory organization containing complexities in products and processes and conflicting tasks, policies, and performance standards (Finch, 1986). Thus, production strategy and inventory withdrawal can each be considered as implicit in at least one other program.

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[1] See White and Ruch (1990) for complete definitions of these programs.

In a related study, White (1990) used focus groups composed of four experts in JIT research and four practitioners experienced in JIT implementation to evaluate (1) the validity of associating each of the ten programs with JIT and (2) the extent to which the ten programs represent a holistic understanding of JIT. The first nine programs address problems within an organization, and the final program, JIT purchasing, focuses on changing relationships with external suppliers (Arnold & Bernard, 1989; Hahn et al., 1983; Newman, 1988). The relationship between JIT purchasing and the other programs, as well as interrelationships among the other programs, needs further examination, however.

Rather than being a collection of isolated programs, JIT is a problem-solving approach to management directed at improving organizations (Hall, 1987). JIT presents a different way of thinking about the scope of manufacturing and inventory management and about design, procurement, product, and distribution policies (Ansari, 1986; Ettlie, 1988; O'Neal, 1989; Schonberger, 1982; Suzaki, 1987). Thus, JIT may be viewed as an integrative system facilitating timeliness and quality not only in production, but also in supply and distribution (Arnold & Bernard, 1989; Hall, 1987; Lee & Seah, 1988). Such integrative thinking requires a multidisciplinary approach to studying JIT (Frazier, Spekman, & O'Neal, 1988; Heiko, 1989; Parnaby, 1988). Existing research is mainly composed of case studies identifying various JIT production or purchasing programs and benefits achieved from their implementation (Giunipero, 1990; Im, 1989; Schonberger, 1986) or simulations of specific production and inventory control programs (Parnaby, 1988). This research provides a foundation for examining the integrative and theoretical underpinnings of JIT.

Overlap and Interrelationships Among Programs

Research on JIT has overwhelmingly focused on the implementation of these programs. Numerous case studies of large manufacturers in repetitive process industries, in particular, have described various programs and their benefits (e.g., Hay, 1988; Schonberger, 1986). Recent research has also focused on the applicability of JIT programs in different environments, such as nonmanufacturing, nonrepetitive process industries and small firms (Billesbach & Schniederjans, 1989; Golhar et al., 1990). Many studies have concluded that not all programs are feasible for certain industries and manufacturing processes (Finch, 1986), and practitioners find identification of appropriate programs difficult (Heiko, 1989).

All the programs associated with JIT appear to include the elimination of wastes and the full utilization of people, equipment, materials, and parts as principles. Several authors have suggested relationships among the programs. For example, multifunctional employees contribute to the preventive maintenance of equipment and provide improvement suggestions through quality circles, which in turn enhance total quality control (Finch, 1986; Juran, 1976; Schonberger, 1986). JIT purchasing facilitates the uniformity of work loads, group technology, and quality programs by providing the right type and quality materials and parts at the right time and in the right quantities (Arnold & Bernard, 1989; Burton, 1988; Chapman & Carter, 1990; Handfield, 1989; O'Neal, 1987). A focused factory program may employ kanban, group technology, and work load uniformity, or one or two of these JIT features, to achieve simplicity in products and processes (AIAG, 1983; Schonberger, 1986).

A theoretical foundation would help researchers and practitioners address the issues of JIT's applicability in various contexts and program interrelatedness. A survey of the literature revealed only two attempts to develop a conceptual model with fundamental constructs and their relationships. Hall (1987) suggested that most companies following the JIT philosophy describe their approach as dealing with three constructs: (1) total quality, (2) people involvement, and (3) JIT manufacturing techniques (improved material flow techniques). He argued that these constructs are highly interrelated. Heard (1986) presented a model of five interrelated constructs: (1) people leverage, which depends on employing workers in multiple functions and on group improvement activities, (2) structured flow paths, including group technology and focused factory programs, (3) dependable supply and demand, realized through JIT purchasing and partnerships with suppliers and customers, (4) linear operations, like kanban and small lot systems, and (5) continuous flows, incorporating preventive maintenance and total quality control. Although both Hall and Heard attempted to break JIT down into constructs on the basis of program research, neither model has been validated.

The current study took a different approach. Working from the identifications of programs associated with JIT in research, we undertook an empirical derivation of constructs. We used content analysis of the derived constructs to develop a theoretical model of JIT systems.

METHODS

We developed a survey instrument of 54 descriptive statements of individuals' perceptions of JIT, containing at least four items relevant to each program. The instrument was pilot-tested by 37 faculty members and graduate students specializing in production and operations management at a major university. Respondents were asked to evaluate each item with respect to how well it described JIT on a Likert-type scale ranging from 5, "strongly agree," to 1, "strongly disagree." We included a sixth response, "do not understand," to help identify confusing statements and asked respondents to comment on the clarity of terminology and statements. The reliabilities of the ten subscales, with alphas ranging from .40 to .70, were also used to identify problem items. We identified 19 items as needing rewording; 2 items that could not be clarified sufficiently were dropped.

The final instrument was administered to professionals familiar with JIT to derive its principal constructs. We mailed surveys to all members of three professional organizations located in a southwestern state: the American Society of Quality Control (ASQC, 658 members); the American Production and Inventory Control Society (APICS, 624 members), and the National Association of Purchasing Management (NAPM, 258 members). Previous research has identified these organizations as strongly interested in and involved with JIT since its implementation in the United States (Giunipero & O'Neal, 1988; Schonberger, 1986). Ten percent of the respondents were members of at least two of these organizations, reducing the nonredundant respondent group to 1,386. A total of 446 complete responses, representing a 32 percent response rate, was obtained. The organizational breakdown was as follows: ASQC, N = 182; APICS, N = 191; and NAPM, N = 73. The groups had nearly identical response rates.

The membership rosters of the three professional organizations and the annual reports of firms employing the individuals surveyed indicated that the respondents represented the population well. Eighty percent of the respondents were men, compared to 82 percent of the total memberships, and 78 percent of both the respondents and the total memberships were employed by manufacturing firms. Consistent with research indicating that JIT tends to be implemented in large manufacturing firms, 86 percent of the respondents reporting JIT implementation were from manufacturing firms, and 59 percent were from firms with sales exceeding $20 million. The APICS and NAPM respondents were fairly similar, with the majority of individuals in materials management and manufacturing positions (60 percent for APICS and 73 percent for NAPM); most ASQC members held positions in quality management (68%). We found no significant differences between the three groups on gender, age, education, or company tenure.

The majority of respondents (65%) were currently employed in firms without JIT implementation. However, 90 percent of the respondents reported multiple exposures to JIT through prior experience, college courses, seminars, in-house training, and reading. Thus, respondents seemed reasonably knowledgeable about JIT. The generalizability of results may be limited, however, by our drawing on professional groups in the Southwest; initial U.S. implementations of JIT occurred in the Midwest, predominantly in the automotive industry.

RESULTS

Examination of the ten subscales describing individual JIT programs revealed acceptable reliability (greater than .70) for each. We submitted the 52 items constituting the scales to exploratory factor analysis to examine underlying dimensions. We applied three criteria in identifying nontrivial factors: (1) eigenvalues greater than 1.0, (2) scree tests, and (3) factor loadings greater than .50.

Dimensions Identified

Initial principal components analysis resulted in 19 factors with eigenvalues greater than 1.0, but only three or four factors appeared nontrivial on the basis of scree test results and factor loadings. We used "varimax" rotation of four factors, but after we recoded several items with negative loadings on the second factor, the scree test and factor loadings clearly indicated dropping the fourth factor. Table 1 reports the final analysis with three factors. Internal consistency as indicated by Cronbach's alpha values is within acceptable limits for factors 1 (.77) and 2 (.76) and is marginally acceptable (.69) for factor 3 (Nunnally, 1978). Content analysis suggested calling the three factors operating structure and control, product scheduling, and quality implementation.

The first factor, operating structure and control, addresses the overall efficiency and effectiveness of an organization. For example, the first item loading on the factor suggests the interrelatedness of JIT procedures and policies, each supporting the other and directed at market competitiveness (Mefford, 1989). The factor includes decentralized control throughout processing stages and elimination of wastes by reducing set-up time, inventory, and defects. Other items address efficient and humane use of people achieved through their participation in quality circles, preventive maintenance, and job rotation. The factor thus captures the two principles on which JIT is based: elimination of wastes and respect for people (AIAG, 1983).

The second factor, product scheduling, focuses on machine utilization and scheduling guidelines for products. Items loading on this factor are meant to streamline product processing: small lots, reduced set-up times, machine utilization, and uniform work loads (cf. Arnold & Bernard, 1989). Product scheduling emphasizes elimination of wastes by optimizing schedules and improving machine use.

The quality implementation factor includes employee training and participation in problem solving, as well as holding employees responsible for quality. Employee abilities are best used by encouraging them to address and solve problems and to become involved in decision making. Through such participation, they learn that they are integral parts of an organization, knowledge that is likely to improve their loyalty and commitment to the organization and increase their productivity (Mefford, 1989; Townsend, 1986).

Perceptions of JIT appear to focus on three dimensions of manufacturing processes and procedures, suggesting that JIT is not a set of techniques or programs to be applied but a systematic approach to controlling and structuring operations, streamlining product scheduling, and implementing quality at the source of problems. We examined the content of items that did not load on any factor and found three types: items containing redundant information, inputs to JIT operations, and outputs. The results are compatible

TABLE 1
Factor Analysis Results[a]

Items	Factor 1: Operating Structure and Control	Factor 2: Product Scheduling	Factor 3: Quality Implementation
1. With JIT all procedures and policies support the factory's competitive ability.	**.617**	.092	.134
2. JIT provides better control through decentralized shop-floor control.	**.601**	−.169	.000
3. JIT preventive maintenance achieves effectiveness through employee participation in maintenance activities.	**.582**	−.194	.004
4. JIT manages more control of the functions through the processing stages.	**.541**	.018	.245
5. JIT systems use employee job rotation at short intervals, which allows operators to use different muscles and senses, reducing muscle and eye strain.	**.534**	.003	.184
6. Cellular manufacturing provides reduced work-in-process and less inventory in JIT.	**.516**	−.192	.080
7. In JIT preventive maintenance is accomplished through employees detecting problems in machinery.	**.504**	.039	.058
8. JIT attempts to reduce set-up times.	**.501**	−.219	.194
9. JIT uses quality circles as a means of eliminating cost defects out of the production system.	**.501**	.037	.064
10. With JIT large lot production diminishes the effect of set-up time and cuts down on labor hours.	.218	**.667**	.016
11. Work-in-process inventory is used to level the production flow with JIT.	.201	**.620**	.180
12. JIT combines production runs to save overall set-up time.	.313	**.568**	.011
13. JIT manufacturing produces products at the rate that optimizes each machine's efficiency.	.252	**.523**	.091
14. Quality circles do not allow direct labor to influence management decisions.	.382	−.221	**−.552**
15. Training in problem solving and a desire to participate is the primary requirement of quality circles.	.345	−.173	**.513**
16. TQC [total quality control] implies quality control must be applied throughout the organization.	.292	−.239	**.504**
17. One of the basic principles of TQC is for employees to correct their own errors.	.283	−.213	**.500**
Eigenvalue	7.06	4.25	2.16
Reliability	.77	.76	.69

[a] Item factor loadings of .50 or greater are reported in boldface. Only those items were included in defining each factor.

with other recent conceptualizations of JIT (e.g., Heiko, 1989; Lee & Seah, 1988; Parnaby, 1988; Suzaki, 1987) but omit wider issues of procurement, design, product policies, and organizational culture (cf. Ansari, 1986; Arnold & Bernard, 1989; Ettlie, 1988; Schonberger, 1986). One or more items from each of the ten subscales loaded on one or more of the three factors, with the exception of JIT purchasing. This exception may be attributable to the influence on respondents of the earlier and greater attention paid to production aspects of JIT (Finch, 1986; Im, 1989; Johnston, 1989), to their assuming appropriate supply for JIT operations (Ramasesh, 1990), or to the survey population used. Researchers and practitioners have given more recent attention to the roles of purchasers and suppliers in JIT (Celley, Clegg, Smith, & Vonderembse, 1986; Chapman & Carter, 1990; Golhar et al., 1990; Im, 1989; Johnston, 1989; O'Neal, 1987). Although purchasing managers would be expected to be most attuned to JIT purchasing, their effect may have been diluted by the relatively small representation of the NAPM, their professional organization (73 out of 446 respondents).

Tests for Differences Between Respondents

Potential differences between the respondent groups were examined through discriminant analysis. We calculated discriminant functions on 55 percent of the respondents, reserving 45 percent for classification (Stevens, 1986). The first analysis assessed whether differences existed between the three professional associations on the derived factors. Two significant functions were calculated, one less than the number of factors or groups (Stevens, 1986). Discriminant function–variable correlations indicated that product scheduling (.79) primarily defined the first function and that a combination of operating structure and control (.90) and quality implementation (.59) defined the second. These correlations, together with group centroids, indicate that the NAPM members scored higher on the first function and lower on the second than either the APICS or ASQC members. Purchasing managers could be expected to be more focused on product scheduling, since they are responsible for establishing deliveries of raw materials that closely coincide with internal product schedules. However, although the functions were significant, canonical correlations were .33 and .20, and only 50 percent of the respondents were correctly classified. Canonical correlations of less than .50 are of little practical value (Stevens, 1986), so we concluded there was little practical difference in understanding of JIT between the groups.

A second analysis assessed whether differences existed between individuals in companies implementing JIT and those in companies not implementing JIT. The discriminant function was significant, but the canonical correlation was quite small (.29), making interpretation of the function of little practical value. A correct classification rate of only 59 percent supported this view. Thus, we concluded there were no practical differences in the two groups' understanding of JIT.

DISCUSSION

Further work is needed to validate the constructs derived in this study and establish their usefulness in theory and application. Several questions arise regarding the constructs and JIT as an integrative system. First, what are the interrelationships among the constructs? Second, how do the identified dimensions facilitate the achievement of JIT objectives and desired outcomes? Third, what is the role of JIT purchasing and other aspects of the ten programs not identified as central tenets of JIT? Fourth, what else influences successful implementation of JIT?

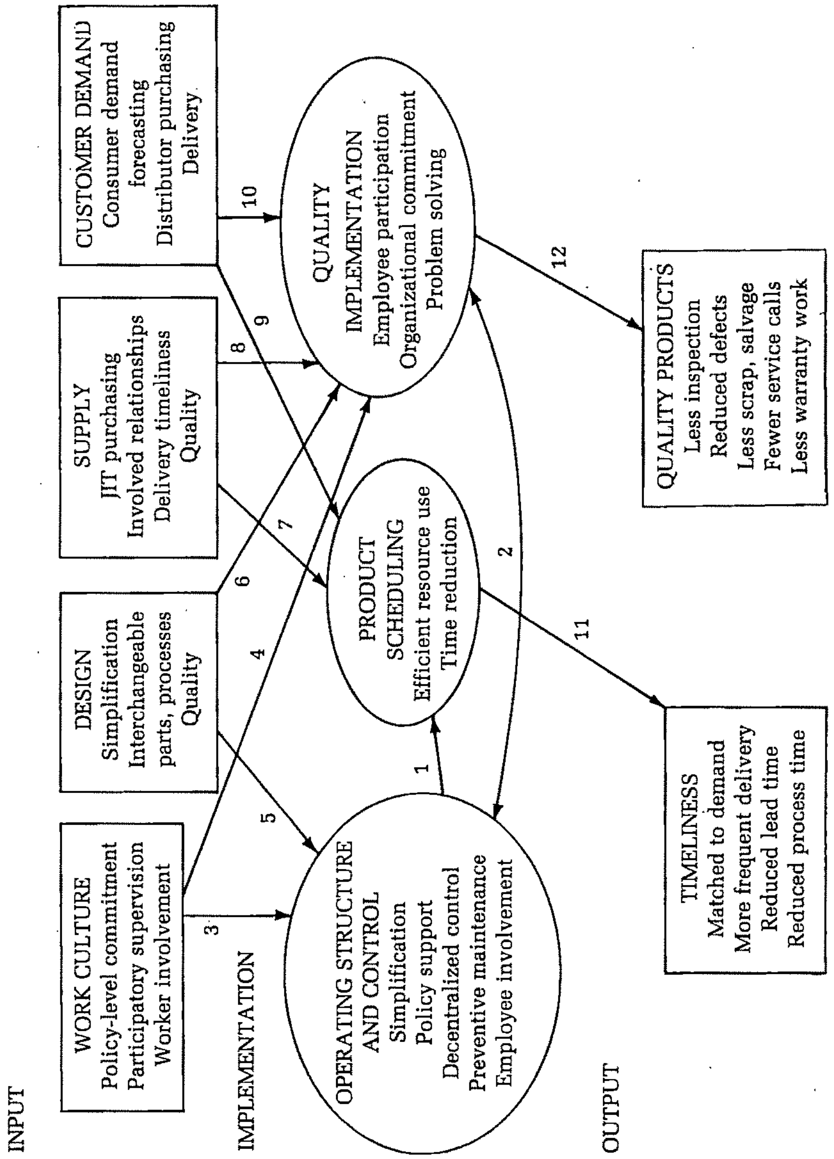
Using the results of the current study and previous research, we are in a position to begin development of a theoretical model of JIT. Figure 1 depicts a proposed system of relationships among the three derived constructs and input and output variables. Because the three derived constructs are the heart of the model, we discuss the relations between these constructs first. Specific components of each construct are used to provide examples of how they are related. Subsequent sections provide the rationale for the inclusion of critical inputs and propositions about their relationships to JIT implementation.

JIT Implementation

As the center of Figure 1 shows, we propose that the three derived constructs are internal implementation dimensions of JIT. Paths 1 and 2 indicate interrelationships between the constructs. First, as firms develop operating structure and control to eliminate waste and make better use of human resources, they improve product scheduling. For example, better preventive maintenance of equipment and simpler setups provide reduction of lead times in product scheduling and more efficient use of equipment (Gupta & Gupta, 1989; Mefford, 1989; Schonberger, 1986). Decentralized control with employee involvement also provides faster problem identification and development of solutions, which in turn reduces work stoppages and lead time and allows for more efficient levels of parts and materials inventory and more efficient use of equipment and human resources (Mefford, 1989; Townsend, 1986).

Second, we posit a reciprocal relation between operating structure and control and quality implementation (path 2), suggesting simultaneity of the effects of these two constructs on each other (Kenderdine & Larsen, 1988; Lee & Seah, 1988; Mefford, 1989; Schonberger, 1986). Quality problems become apparent when inefficiencies are removed through improved operating structure and control. For example, large inventories buffer production stages from each other; lower JIT inventories expose quality problems resulting from poor-quality materials, poorly maintained equipment, and poorly trained or motivated employees (Arnold & Bernard, 1989; Mefford, 1989; Suri & Treville, 1986). With less buffer inventory, production stops when quality parts are not available for the next production stage, resulting in a search for and faster solution to quality problems (Finch, 1986; Gupta &

FIGURE 1
JIT Input, Implementation, and Output System



Gupta, 1989). Quality problems are also spotted quickly with simplification of structure and visual control through clean, orderly work areas. These features, combined with the application of worker creativity to solve problems, result in better quality control (Finch, 1986; Handfield, 1989; Heiko, 1989; Schonberger, 1986). Employee involvement gives workers the responsibility for shutting down production and the authority to do so, leading to control of quality before too many problematic products go by (Abernathy et al., 1981; Walleigh, 1986). Thus, improved operating structure and control facilitates employee problem solving and total quality control.

Quality implementation also promotes improvement in operating structure and control. With organizational commitment to quality, employees participate by inspecting quality on the shop floor, proposing ideas for improvement, and providing information regarding problems resulting from poor maintenance of equipment, complexities in setups, and lack of training (Mefford, 1989). Information from quality circles allows a company to streamline operating systems and setups (Griffin, 1988; Juran, 1976), and as employees improve at identifying problems affecting quality, employee involvement and decentralization of control can be increased (Townsend, 1986). Finally, quality implementation reduces inspections, work stoppages, defective products, and buffer inventories, as well as their costs (Kenderdine & Larsen, 1988; Mefford, 1989).

Examples based on the content of the derived constructs illustrate their potential interrelatedness. However, to structure and control operations, streamline scheduling, and implement quality, companies may need several key inputs, including the development of an appropriate work culture, design of products and processes, development of supplier relationships, and explicit consideration of the demands of customers (Ansari, 1990; Chapman & Carter, 1990; Chelte, Hess, Fanelli, & Ferris, 1989; Ettlie, 1988; Schonberger, 1986).

Inputs

Figure 1 models four input variables identified from the JIT literature: work culture, design, supply, and customer demand. Researchers have cited the four proposed inputs as prerequisites but also as possible obstacles to successful JIT implementation (e.g., Arnold & Bernard, 1989; Burt, 1989; Celley et al., 1986; Ettlie, 1988; Giunipero, 1990; Hall, 1987; Handfield, 1989; Walleigh, 1986). Although a full development of the role of inputs to JIT implementation is beyond the scope of this article, we give illustrative propositions.

Work culture. The focus of work culture is a policy-level organizational commitment to helping supervisors and other employees understand and accept the changes that may result when JIT is implemented. In many organizations, decentralization of control in decision making and employee involvement in preventive maintenance and job rotation, for instance, are significant changes in philosophy affecting all levels, from top managers down to production workers (Burton, 1988; Chelte et al., 1989). In general, JIT adoption pressures all employees to look for ways to do their jobs more efficiently (Suri & Treville, 1986). Organizational policy supporting such changes enhances improvements in operating structure and control (Figure 1, path 3). In addition, educating all employees about JIT's operations and benefits to the organization facilitates their acceptance of cooperation in gaining the structure and control needed (Billesbach & Schniederjans, 1989) through reducing resistance to change and promoting acceptance of JIT goals and objectives (Fatehi-Sedah, 1984; Helms, 1990). Thus, policies and programs promoting cooperation between employees and management promotes improvements in operating structure and control (Wayne, Griffin, & Bateman, 1986).

A work culture promoting extensive employee participation is also needed for quality implementation (Figure 1, path 4). Implementation of quality through quality circles and total quality control depends on the involvement and commitment of managers and workers (Ebrahimpour & Lee, 1988; Juran, 1976; Wayne et al., 1986). Organizational policies mandating the training of managers and workers for blended responsibility and worker accountability for quality improves quality implementation (Billesbach & Schniederjans, 1989; Griffin, 1988; Handfield, 1989; Klein, 1989). JIT operations provide an unprecedented capacity for work force management, but the culture needed requires managements to relinquish some formal control, replacing it by giving workers the authority and time to address quality problems and make necessary changes and the training allowing them to do so (Abernathy et al., 1981; Chelte et al., 1989; Helms, 1990; Townsend, 1986). Thus, a top management commitment to quality, in both policy and practice, supports quality implementation.

Design. New design principles specifically geared to JIT include simplification, reduction of design time, and use of "part-family flexibility" (Ettlie & Stoll, 1990: 62). Simplification of production processes, particularly use of group technology, forces the integration of design and production, which reduces numbers of parts and minimizes engineering changes through modular designs for a variety of products (Burbidge, 1975; Ettlie, 1988; Schonberger, 1986). For group technology to be successful, production and design engineers and suppliers must work together to produce and carry out designs that result in fewer steps and reduced setups, lead times, and parts inventories (Ettlie & Stoll, 1990). Thus, operating structure and control can be simplified (Figure 1, path 5).

Several authors have noted the impact of product and process design on quality implementation (path 6) (e.g., Ettlie, 1988; Handfield, 1989; Mefford, 1989). Design determines many of the costs and other characteristics shaping quality (Ettlie & Stoll, 1990), and when design focuses on quality, employees on the shop floor can concentrate on quality problems arising from machining, product handling, and worker mistakes (Hahn et al., 1983; Heiko, 1989; Schonberger, 1986). Quality designs reduce the time needed for quality implementation at the operations level (Ettlie, 1988).

Supply. The third input, supply, focuses on JIT purchasing, relations with suppliers, and timely delivery of quality parts and materials. Frequent purchasing of smaller quantities of parts and materials of consistently high quality is critical to the reduction of inventories, production lot sizes, and lead times (O'Neal, 1987; Parnaby, 1988; Ramasesh, 1990). Successful JIT implementation depends on the development of appropriate purchasing policies and highly involved supplier relationships (Ansari, 1990; Arnold & Bernard, 1989; Chapman & Carter, 1990; Ebrahimpour & Lee, 1988; Frazier et al., 1988; Giunipero, 1990; Handfield, 1989; Newman, 1988; Suri & Treville, 1986).

Our proposal is that purchasing and delivering the right quantity and quality of supplies at the right time is critical to product scheduling (Figure 2, path 7), allowing smaller inventories and relatively level rates of material usage. This procedure reduces throughput time by minimizing stoppages resulting from insufficient or poor-quality incoming parts and materials (Ansari, 1990; Burton, 1988; Kenderdine & Larsen, 1988; Mefford, 1989; Newman, 1988). Further, inconsistent incoming quality hampers product scheduling, since the exact quantities needed cannot be determined (Arnold & Bernard, 1989). As path 8 in Figure 1 suggests, supply also affects quality implementation. Incoming quality is a prerequisite to quality implementation in an organization (Burton, 1988; Giunipero, 1990; Handfield, 1989; Mefford, 1989; Schonberger, 1986; Suri & Treville, 1986) because it is expected for total quality control (Chapman & Carter, 1990), reduces the need for inspections (Hahn et al., 1983), and allows for more attention to be given to quality problems occurring within operations (Ebrahimpour & Lee , 1988; Griffin, 1988). A significant opportunity for integration of suppliers into JIT systems exists, regarding not only product scheduling and quality issues, but also their involvement in product design and JIT implementation in their operations (Arnold & Bernard, 1989; Chapman & Carter, 1990; Ettlie, 1988; Ettlie & Stoll, 1990; Hahn, Watts, & Kim, 1990).

Customer demand. The fourth input focuses on final consumer demand, distributor purchasing, and delivery of completed products. Paths 9 and 10 in Figure 1 suggest that customer demand directs product scheduling and sets standards for quality implementation, in a manner similar to how kanban programs pull components from downstream operations (Parnaby, 1988). Several authors have suggested treating customer demand as an input to JIT operations (e.g., Celley et al., 1986; Hall, 1983; Parnaby, 1988; Schonberger, 1986; Suzaki, 1987), but the idea has received very little attention (Ettlie & Stoll, 1990; Frazier et al., 1988; Giunipero & O'Neal, 1988).

Variations in the types and amount of products and the timing of demand are seen as sources of forecast error (Handfield, 1989), but the specification of lead times, costs, product assortment, and quality to the customer market is essential for the competitive success of JIT systems (Arnold & Bernard, 1989; Ebrahimpour & Lee, 1988; Ettlie, 1988; Parnaby, 1988; Schonberger, 1986). Production scheduling and transportation scheduling for the customer market combine to reduce overall product scheduling time and, subsequently, to produce timely output. Considering the external costs of quality failures, like returns, warranty work, and loss of business (Kenderdine & Larsen, 1988), further supports the validity of the role of customer demand in determining quality specifications. Thus, distributor and consumer demand drive the specific objectives of timeliness and quality, and explicit consideration of customer demand sets the stage for efficient and effective product scheduling and quality implementation.

Outputs

The final paths indicated in Figure 1 show the relationships of JIT implementation and its primary outputs, timeliness (path 11) and quality products (path 12). We have modeled them as direct functions of product scheduling and quality implementation and as indirect functions of operating structure and control and of the input variables. In particular, reducing production time and solving quality problems directly contribute to the overall timeliness and quality of products as outputs of a JIT system.

Firms meeting the objectives of timeliness and quality should be able to further reduce both inventories and such associated costs as handling, storage, and carrying costs as well as the costs of quality inspections and failures (Kenderdine & Larsen, 1988; Mefford, 1989). Timely provision of quality products should also lead to market competitiveness and longer-term customer relationships, key elements in the long-run success of a firm (Finch, 1986; Golhar et al., 1990; Hall, 1983).

Implications for Future Research

The empirical results presented here are a first step toward the integrative thinking that seems inherent in JIT. The next step is to test these factors in future research, particularly as they relate to the input and output components of JIT. Emphasis on specific programs may limit possibilities for understanding and, ultimately, implementing JIT. If these programs are interpreted in light of operating structure and control, product scheduling, quality implementation, and the objectives and desired outcomes for individual firms, new JIT systems may be successfully implemented in a variety of firms.

The model presented, however, also embodies a systems perspective on management of input and output dimensions and both external and internal constituencies and concerns. This emphasis reflects the view that JIT must be managed as an open system in which internal operations, organizational culture, design, supply, and customers are combined (Ettlie & Stoll, 1990; Parnaby, 1988; Suzaki, 1987). To test the proposed model will likely require a longitudinal field study. In addition, we suggest further development of the relationships between input variables. For example, successful JIT implementation requires a change in philosophy from a price to a quality emphasis in purchasing on the part of both top management and those responsible for supplier relationships. Policy-level commitment from an organization and retraining of buyers promote changes in purchasing and in developing involved cooperation with fewer suppliers. Designs incorporating quality and flexibility objectives also must be tailored to management and work group cultures, or those cultures must change. Further, design of high-quality, simpler products and interchangeable parts also implies supplier involvement and at least acceptance by customers. Reciprocally, JIT purchasing and supplier involvement mean more participation by design engineers with purchasers and suppliers.

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PREDICTING PARTICIPATION AND PRODUCTION OUTCOMES THROUGH A TWO-DIMENSIONAL MODEL OF ORGANIZATIONAL COMMITMENT

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In this study, we tested a two-dimensional model of organizational commitment and theoretically relevant outcomes based on the motivational distinction proposed by March and Simon (1958) between employees' decisions to participate and to produce. We conducted a longitudinal field study involving 288 employees of a financial services organization. Confirmatory factor analyses support the proposed distinction. Commitment leading to participation was called "continuance commitment", and that leading to production, "value commitment." Analyses of correlations and partial correlations show that turnover is more strongly related to continuance than to value commitment and that performance is more strongly related to value commitment.

A promising approach to the topic of employee motivation is one that views motivation as a result of independent decisions with respect to different types of organizationally relevant behaviors. March and Simon (1958) theorized that an employee makes two distinct, ongoing decisions about an organization: one to participate, the other to produce, or perform. An important implication of this perspective is that "decisions by workers to participate in an organization reflect different considerations from decisions to produce" (March & Simon, 1958: 83). The considerations that lead to a decision to participate are based on the notion of exchange between individual and organization; employees balance the inducements the organization provides against the contributions required to maintain membership. The considerations that lead to decisions to produce include the strength of an employee's identification with the goals and values of the organization. This view of motivation suggests that there are multiple models of motivation that are specific to the behavior of interest. Models of the decision to participate are relevant for predicting decisions to join, attend, and remain a

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member of an organization. Models of the decision to produce are relevant to predicting outcomes such as performance, citizenship behaviors, and satisfaction with work.

One approach that researchers have often employed to understand why employees behave as they do is the study of organizational commitment. Definitions of commitment have differed in the extent to which they emphasize the considerations relevant to participation or production. For example, Hrebiniak and Alutto focused more on the exchange, or participation, framework, defining commitment as "a result of individual-organizational transactions and alterations in side bets or investments over time" (1972: 556). Hall, Schneider, and Nygren dealt more with the issues that lead to shared values in defining commitment as "the process by which the goals of the organization and those of the individual become increasingly integrated or congruent" (1970: 176). Lamenting the lack of a commonly accepted definition of commitment, Stevens, Beyer, and Trice (1978) reported that there were two distinct approaches to the definition of organizational commitment in the literature: an exchange approach and a psychological approach. Morris and Sherman (1981) elaborated on Stevens and colleagues' observation, noting that theorists favoring exchange approaches have viewed commitment as an outcome of an inducements-contributions transaction between an organization and a member, but those taking a psychological approach have depicted a positive, high-intensity orientation toward the organization. These observations about previous research are consistent with the March and Simon (1958) framework.

In a study of a two-dimensional model of commitment, Meyer, Paunonen, Gellatly, Goffin, and Jackson (1989) reported that "affective commitment" was positively related to performance, and "continuance commitment" was negatively related to performance. O'Reilly, Chatman, and Caldwell (1991) distinguished between "normative commitment" and "instrumental commitment," reporting that a measure of person-organization fit based on shared values was significantly related to normative commitment but not to instrumental commitment.

The most widely accepted and used definition of organizational commitment in current research is that of Porter, Steers, Mowday, and Boulian (1974), who developed the Organizational Commitment Questionnaire (OCQ). They defined organizational commitment as the strength of an individual's identification with and involvement in a particular organization, characterizing it by three psychological factors: desire to remain in the organization, willingness to exert considerable effort on its behalf, and belief in and acceptance of its goals and values. A closer examination of these factors reveals a correspondence between the theoretical basis of organizational commitment and the motivational dimensions March and Simon identified. Specifically, the decision to participate is reflected in the "desire to remain in the organization," and the decision to produce is well described by "a willingness to exert considerable effort on behalf of the organization" and "belief in and acceptance of the goals and values of the organization."

PREDICTING PARTICIPATION AND PRODUCTION OUTCOMES

Several studies have examined the merits of differentiating between the types of commitment that lead to participation and those that lead to production. Angle and Perry (1981) factor-analyzed the OCQ and found two factors, which they labeled "value commitment" and "commitment to stay." Intent-to-quit and actual separation rates both showed stronger relationships with commitment to stay than with the composite organizational commitment score. Two measures of effectiveness yielded stronger relationships with value commitment than with the composite measure of organizational commitment.

Schechter (1985) developed a measure of organizational commitment designed to differentiate between the two commitment dimensions, which he called "value commitment" and "continuance commitment." The measure, closely based on the OCQ, was designed to include sufficient numbers of items to reflect each dimension. Schechter found that continuance commitment was significantly correlated with intentions to quit, and value commitment was significantly correlated with self-ratings of performance, extra-role behaviors, and satisfaction with the organization. Each dependent variable was more highly correlated with the predicted dimension of commitment than with the other dimension.

In the present research, we defined value commitment as a belief in and acceptance of organizational goals and values and a willingness to exert considerable effort on behalf of the organization. An individual who is high in value commitment is motivated to produce. Continuance commitment is defined as the desire to remain a member of the organization. An individual who is high in continuance commitment is motivated to participate. We propose that these two dimensions lead to distinct sets of organizationally relevant outcomes. An individual with strong continuance commitment should have a stronger intent to stay and be less likely to quit than a counterpart with lower continuance commitment. Further, the continuance-committed individual should be expected to avoid behaviors that might jeopardize organizational membership. One behavior that should be negatively correlated with continuance commitment is absenteeism, as excessive absenteeism could be a reason for termination. Thus, continuance commitment should be positively correlated with intent to stay and negatively correlated with absenteeism and quitting.

An individual who is value-committed should be expected to engage in behaviors that would help the employing organization achieve its goals. The individual should be likely to engage in behaviors helpful to the organization regardless of whether or not they are an expected part of the person's role. Therefore, both performance and organizational citizenship behaviors should be positively correlated with value commitment. Additionally, an individual who believes in the goals and values of the organization should be more satisfied with the organization than a counterpart who does not so believe.

Thus, the hypotheses of the study are that absenteeism, intent to stay, and quitting will be more strongly related to continuance commitment than to value commitment and that performance, citizenship behaviors, and satisfaction will be more strongly related to value commitment.

METHODS

Data and Procedures

The data were collected in a major national financial institution over a period of two years. A total of 330 employees across five departments in this organization participated in the study. Hierarchical level of the respondents varied from entry level clerical to vice president. We collected data from participating employees in two waves of surveys separated by two months. Of the employees surveyed, 288 (87.3%) responded to the first wave of data collection, and 228 (69.1%) responded to the second. Table 1 gives demographic data.

Respondents were given time away from their normal duties to respond to each written survey. In the first wave, we collected data on the commitment dimensions. In the second wave, we collected data on the commitment dimensions and on self-reported outcomes. This procedure provided an opportunity for both an assessment of the stability of the commitment measures and a time lag of two months between the first-wave commitment measure and the self-reported outcomes. The results reported here are based on first-wave commitment data in order to allow for the time lag. We asked respondents to provide their social security numbers so that we could match the sets of surveys to each other and to data provided by the organization. Use of these numbers allowed 146 responses (44.2 percent of the original 330) to be matched both between waves and with archival data. Respondents were informed of the reason for requesting social security numbers and assured of the confidentiality of their responses.

Measures

The two dimensions of organizational commitment, value commitment and continuance commitment, were measured by scales developed by

TABLE 1
Respondent Profile

Demographic Features	Minimum	Maximum	Mean	Percentage
Age	19	65	33.9	
Years of tenure	0.5	31.9	6.3	
Gender				
Men				34.1
Women				65.9

Schechter (1985) (see Appendix A). According to Schechter, a factor analysis confirmed a two-factor solution, with the factors reflecting the two dimensions of value and continuance as described in this article. Schechter found both commitment scales to exhibit good psychometric properties, with Cronbach's alpha equaling .90 for value and .85 for continuance (1985: 43).

Our measurement of the outcome variables was based on a mix of self-report and archival data. Intent to stay was measured by a single seven-point Likert-type item assessing agreement with a statement of not intending to leave within the foreseeable future. Absenteeism was measured as the total number of unexcused absences for the year in which the study was conducted. These data were obtained from the organization.

Data from performance appraisals conducted from 6 to 27 months after the first survey administration were obtained from the organization. We used the latest performance data available in developing the performance measure in order to allow for an adequate lag. We measured organizational citizenship behaviors using Williams and Anderson's (1991) ten-item altruism scale, which was based on Smith, Organ, and Near (1983).[1] In addition, an open-ended item on the first survey asked what behaviors and activities were not rewarded by the organization but should have been. A content analysis of the responses generated eight items that we grouped into a scale labeled "organization-specific citizenship behaviors." Satisfaction with opportunities for growth was measured using a four-item scale developed by Hackman and Oldham (1975).[2] We used this facet of satisfaction to test the differential prediction since it offered the closest conceptual link to value commitment.

RESULTS

Table 2 presents means, standard deviations, and intercorrelations among the variables, as well as Cronbach's alphas for all scales consisting of three or more items.

Confirmation of the Proposed Two-Factor Structure

We performed a confirmatory factor analysis on the commitment items using LISREL 7 (Jöreskog & Sörbom, 1989) and compared the proposed two-dimensional model with several alternative models to see which was most consistent with the data. The bases for comparison are increments in various fit indexes calculated from a null model, which is the most restrictive theoretically appropriate model (cf. Bollen, 1989: 270). Three theoretical models

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[1] We collected data for a six-item measure of compliance (Smith et al., 1983) but omitted the scale from further analyses because its coefficient alpha was low (.53).

[2] Data were collected on the other facets of satisfaction included in the Hackman and Oldham scale. The results for the other facets were very similar to those for growth. For the sake of brevity, they are not reported.

TABLE 2
Means, Standard Deviations, and Correlations[a]

Outcome Variables	Means	s.d.	1	2	3	4	5	6	7
1. Absenteeism	0.21	1.08							
2. Intent to stay	4.60	1.85	.00						
3. Quitting			.19***	−.29***					
4. Performance	3.46	0.73	−.23***	−.08	.01				
5. Altruism	3.65	0.54	−.22**	.03	−.01	.20*	(.79)		
6. Organization-specific citizenship behaviors	3.16	0.68	−.14*	.00	−.07	.11	.52***	(.72)	
7. Satisfaction	4.56	1.40	−.06	.55***	−.24**	.13	.11	.16**	(.84)

[a] Coefficient alphas are in parentheses.

* $p < .05$

** $p < .01$

*** $p < .001$

were examined: a single-factor model, a model with two uncorrelated factors, and the proposed model (see Table 3). (See Appendix B for LISREL factor loadings.) The proposed model fit better than the others on all the fit indexes used: chi-square, goodness of fit, adjusted goodness of fit, root mean square residual, normed-fit, and parsimonious normed-fit. Jöreskog and Sörbom (1989), Bentler and Bonnett (1980), and James, Mulaik, and Brett (1982) describe these fit measures. All these measures are positively related to a model's fit except for chi-square and the root mean square residual, which are inversely related to model fit. Using the modification indexes produced by LISREL 7, we also estimated three of the elements of the theta-delta ($\theta\delta$) matrix, adding one at a time (MacCallum, 1986: 108). Each element represents a covariance between error terms of within-factor items. The estimation of these parameters has no theoretically important effect on the proposed model, but the fit indexes generally improved with each successive element estimated. With these three elements estimated, the normed-fit index reaches the .90 level suggested by Bentler and Bonnett (1980) as reflecting a good fit.

Differential Prediction of Outcomes

Zero-order correlations were produced between each dimension and each outcome variable. As predicted, all the value commitment outcomes were significantly correlated with value commitment, and each correlation was in the predicted direction. Of the continuance commitment outcomes, the two variables most clearly related to staying in the organization (intent to stay and quitting) were significantly correlated with continuance commitment. The correlation with absenteeism was not significant. Thus, all but one of the outcomes were significantly correlated with the predicted commitment dimension, and all significant correlations were in the predicted directions. Several outcome variables were significantly correlated with the nonpredicted dimension of commitment. In order to examine the differential predictions, we compared the correlations between each outcome and the two commitment dimensions, computing the significance of the difference between dependent correlations for each pair of correlations (Ferguson, 1966: 189). Table 4 gives results of this analysis.

For absenteeism and intent to stay, the differences between their correlations with the two commitment dimensions were not significant. In other words, each of these continuance commitment outcomes was correlated about the same with each dimension of commitment. As predicted, quitting was significantly more highly correlated with continuance commitment than with value commitment. The pattern of results for the value commitment outcomes was very consistent with predictions. For each of these outcomes, the correlation with value commitment was significantly larger than the correlation with continuance commitment.

Analyses of Partial Correlations

Because the correlation between value and continuance commitment was fairly high (.59), we conducted further analyses to determine the inde-

TABLE 3
Comparison of LISREL Models for Commitment Items

Models[a]	*df*	χ^2	Goodness of Fit Index	Adjusted Goodness of Fit Index	Root Mean Square Residual	Normed-Fit Index	Parsimonius Normed-Fit Index
Null[b]	136	2,104.21	.305	.218	.863		
Single-factor	119	444.22	.813	.760	.204	.79	.69
Two uncorrelated factors	119	427.54	.868	.830	.540	.80	.70
Proposed[c]	118	285.56	.898	.868	.149	.86	.75
$\Theta\delta$ (17, 13) free	117	250.59	.909	.880	.145	.88	.76
$\Theta\delta$ (10, 9) free	116	229.66	.915	.888	.143	.89	.76
$\Theta\delta$ (13, 10) free	115	213.27	.921	.894	.142	.90	.76

[a] All models were tested using covariance matrices and maximum likelihood estimation.

[b] Null model: $q = n$, $x = \xi$, $\Theta\delta = 0$, $\Lambda_x = I$, Φ = diagonal and free.

[c] Proposed model: $\xi = 2$, $x = 17$, $\Theta\delta$ = diagonal and free, Λ_x = full and fixed (except for freeing of appropriate parameters as indicated above to yield loadings), and Φ = symmetric and free. Factor loadings for the proposed model appear in Appendix B.

TABLE 4
Zero-order and Partial Correlations Between Commitment and Outcome Variables

Outcome Variables	Value Commitment	Continuance Commitment	Difference Between Correlations	df	t	Partial Correlations
Continuance commitment						
Absenteeism	−.14**	−.05	.09	266	1.57	.03
Intent to stay	.39***	.38***	.01	143	0.15	.21**
Quitting	−.12*	−.21***	.09	274	1.75*	−.18**
Value commitment						
Performance	.17**	−.11	.28	193	4.53***	.28***
Altruism	.19**	−.06	.25	143	3.46***	.28***
Organization-specific citizenship behaviors	.32***	−.01	.33	143	4.79***	.39***
Satisfaction	.49***	.29***	.20	143	3.05**	.42***

* p < .05
** p < .01
*** p < .001

pendent contribution of each dimension to predicting the outcome variables. First-order partial correlations were computed between each commitment dimension and its proposed outcomes (Table 4). After we controlled for the variance shared with value commitment, both intent to stay and quitting were significantly correlated with continuance commitment, although absenteeism was not. After "partialling out" the variance shared with continuance commitment, we found that all the value commitment outcomes were still significantly correlated with value commitment. These analyses provide additional support for the proposed two-factor model of commitment.

DISCUSSION

The goals of this research were to verify that organizational commitment can be characterized in terms of two distinct dimensions that are conceptually related to the March and Simon (1958) framework and to show that these two dimensions lead to distinct classes of organizationally relevant outcomes.

Are the Dimensions Distinct?

The correlation between value and continuance commitment suggests that the dimensions represent overlapping conceptual space. This finding is consistent with previous research on organizational commitment (e.g., Meyer, Allen, & Gellatly, 1990). In a recent review and meta-analysis of the commitment literature, Mathieu and Zajac noted that "attitudinal and calculative commitment are not entirely distinguishable concepts," but added that "the two forms of OC are sufficiently distinct to permit comparisons between their relative relationships with other variables" (1990: 172). Taken together, these data suggest that value and continuance commitment are not theoretically independent but that there is utility in examining the concepts separately, using partial correlations or regression analyses to make more precise predictions of conceptual relationships. Research investigating the causal direction of the relationship between value and continuance commitment would be consistent with this view.

How Useful Is the Distinction in Predicting Outcomes?

The data suggest that the two-factor model of commitment proposed in this study is useful in differentially predicting organizationally relevant outcomes. Value commitment has significantly stronger relationships than does continuance commitment with citizenship behavior, satisfaction, and an independent measure of performance. Continuance commitment has a significantly stronger relationship than does value commitment with quitting measured over a two-year period. The self-report measure of intent to stay is significantly related to both value and continuance commitment, and the magnitude of the relationship is not different for the two dimensions.

Contrary to expectations, the correlation of absenteeism with continuance commitment was not stronger than that with value commitment, although there is some evidence that organizational policies may have confounded the results for absenteeism. The relative clarity and harshness of companies' policies and statements about permitted absences would affect the empirical relationships observed. If an organization takes punitive action after relatively few absences, the shape of the relationship between continuance commitment and absenteeism would differ from what it would be under a less punitive policy. The organization in which the data were collected had a clear policy on absenteeism and what punitive actions would be taken after a given amount of unexcused absence. The policy was well known to employees and provided for a considerable amount of discretionary absence. Such a situation could be expected to reduce the correlation between continuance commitment and absenteeism because unexcused absence would not endanger continued employment except in an extreme case, and even then an employee would know exactly how much more absence would be tolerated.

The time lag in the study between the collection of the commitment variables and the self-reported outcomes was designed to minimize the effect of common method variance resulting from the use of cross-sectional survey data, a serious problem in much of the research on organizational commitment. The use of differences in the magnitude of correlations as the basis for assessing the validity of the model effectively eliminated any remaining bias in the correlations resulting from common method variance for outcomes measured through self-report data. It should also be noted that a number of the outcome variables (absenteeism, quitting, and performance) were collected through independent methods and with meaningful time lags (up to two years). These characteristics of the current research make it unique in the literature on organizational commitment and contribute to the credibility of the findings. The analyses of partial correlations assessing the relationships between the commitment dimensions and each predicted outcome variable revealed as strong a pattern of predictions as did the analyses of the zero-order correlations. This suggests that in spite of the overlap in concepts, the unique variance attributable to each dimension was at least partially responsible for the observed relationships.

Why Not Just Value Commitment?

One important theoretical question remains unanswered. Although the data show considerable evidence of differential prediction, it is also clear that value commitment did a very creditable job in predicting all the outcomes in the study. Given this evidence, does continuance commitment add sufficient marginal utility to warrant its inclusion in future research on organizational commitment? Our judgment is that it does. The key evidence for the inclusion of continuance commitment is its significantly stronger relationship with quitting, the behavioral outcome most clearly conceptually linked with continuance commitment. In this study, data for the measure of quitting were gathered over two years, a sufficient length of time for individuals with low continuance commitment to actually leave the organization. Turnover resulting from quitting is an important outcome for organizations but is very difficult to measure. Organizational researchers therefore often replace it with a behavioral intention proxy. In a meta-analysis of the turnover literature, Steel and Ovalle (1984) reported an average correlation (after correction for statistical artifacts) between "turnover intent" and actual turnover of .50. This level of relationship significantly limits researchers' ability to predict actual turnover. In our data, these two variables were correlated at .29. Our results indicate that value commitment predicted intentions to quit as well as did continuance commitment. Actual turnover, on the other hand, was significantly better predicted by continuance than by value commitment. As suggested above, one possible explanation of this pattern of findings is that individuals who are value-committed may indicate that they intend to stay in an organization, but if they are not continuance-committed, will leave when the opportunity presents itself. This explanation of the causal relationships among these variables warrants further investigation.

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APPENDIX A

Continuance Commitment

1. The longer I stay with this organization, the harder it is to leave.
2. It would be difficult for me to adapt to a new organization.

3. Many changes would have to occur in my present circumstances to cause me to leave this organization.[a]
4. It would be hard on my family if I decided to leave this organization at this time.
5. I would accept almost any type of job assignment in order to keep working for this organization.[b]
6. It would be easy for me to decide to leave this organization and give up the benefits that have accrued over the years.
7. I would be willing to stick with this organization until I retire.[c]
8. If I decided to leave this organization, it would be difficult to explain to my friends and family.
9. I would give up a lot by leaving this organization.
10. I am grateful for the opportunity this organization has provided me.[c]

Value Commitment

1. For me, this is one of the best of all organizations for which to work.[a]
2. I am proud to tell others that I am part of this organization.[b]
3. I usually agree with this organization's policies on important personnel matters.[a]
4. I talk up this organization to my friends as a good organization to work for.[a]
5. I care about the fate of this organization.[a]
6. I find that my values and the organization's values are very similar.[b]
7. I am glad I chose this organization to work for over others I was considering at the time I joined.[a]
8. This organization inspires the best in me in the way of job performance.[a]
9. I am willing to put in a great deal of effort beyond that normally expected in order to help this organization be successful.[b]

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[a] This item is adapted from the OCQ.

[b] This item is taken verbatim from the OCQ.

[c] We dropped this item from the scale on the basis of preliminary analyses of factor loadings.

APPENDIX B
Factor Loadings

The LISREL factor loadings shown in this appendix are from the proposed model, which is described in Table 3. The loading of each item on the nonproposed factor was constrained to zero in this confirmatory analysis and is therefore not shown here.

Continuance Items[a]	Loadings	Value Commitment Items[a]	Loadings
1	1.26	1	1.19
2	0.94	2	1.00
3	1.47	3	0.86
4	0.86	4	1.15
5	1.00	5	0.81
6	0.99	6	1.21
8	0.87	7	0.93
9	1.20	8	1.30
		9	0.84

[a] The item numbers refer to the items listed in Appendix A.

Roger C. Mayer is an assistant professor of management at the University of Notre Dame. He received his Ph.D. degree in organizational behavior and human resource management from Purdue University. His research interests are employee attitudes, motivation, decision making, and leadership.

F. David Schoorman is an associate professor of organizational behavior and human resource management at Purdue University. He received his Ph.D. degree in industrial administration from Carnegie Mellon University. His interests include decision making, motivation, and organizational effectiveness.

SPECIAL RESEARCH FORUM CALL FOR PAPERS: CONFIGURATIONAL APPROACHES TO ORGANIZATION

The *Academy of Management Journal* is pleased to announce a call for papers for a Special Research Forum on Configurational Approaches to Organization. Guest co-editors for the forum will be Bob Hinings, Alan Meyer, and Anne Tsui.

Out of the theoretically infinite set of possible combinations of organizational attributes, some theorists and researchers contend that only a relatively small subset constitute viable combinations that may characterize organizations empirically. Various dimensions of organization environments, technologies, strategies, structures, cultures, ideologies, processes, practices, and members have been said to cluster into configurations, archetypes, or gestalts. The term "organizational configuration" is used here to denote any multidimensional constellation of conceptually distinct variables that commonly occur together.

The purpose of this Special Research Forum is to synthesize and extend knowledge about organizational configurations. Configurations may arise from typologies developed conceptually or from taxonomies derived empirically. They may be situated at multiple levels of analysis, depicting common patterns within departments, divisions, organizations, or networks of organizations. Different configurations exhibit different interrelationships among constituent variables, such that classifying social units into configurations enables prediction of significant differences along dimensions not used to make the classification. This might occur, for example, if grouping organizations on the basis of technologies justified inferences about their employees' motives, or if grouping interorganizational alliances on the basis of forms of governance justified inferences about the partners' internal structures.

Suitable papers could show, for instance, that identifying configurations has important implications for the existence or the form of relationships between variables, that classification along certain dimensions predicts counterintuitive differences along other dimensions, or that controlling for configurations resolves a long-standing dispute in the literature. Because covariates of configurations might range from occupying unique ecological niches to following unique HRM practices, submissions by authors from diverse disciplines and all professional divisions of the *Academy of Management* are invited.

Configurations are evidenced by diverse organizational outcroppings, so methods ranging from ethnography to simultaneous equations may be used in gathering and analyzing data. Papers focusing on discontinuous or punctuated equilibrium models of change would be appropriate, because the configuration approach implies that significant organizational change often will require near-simultaneous changes in a host of interrelated variables. Human brains are inclined to perceive patterns even among random arrays of objects, thus papers treating configurations as products of managerial and organizational cognitions fit the domain of this forum. Finally, because organizational configurations can influence and be influenced by phenomena at many levels of analysis, we encourage authors to investigate cross-level effects.

In preparing manuscripts, authors should follow standard *AMJ* requirements specified in *AMJ*'s "Style Guide for Authors." Cover letters should request that papers be considered for this Special Research Forum. Five copies should be sent to Professor Michael Hitt, *Academy of Management Journal*, College of Business Administration, Texas A&M University, College Station, Texas 77843-4221. Papers must be received no later than September 1, 1992. All submisions will be blind reviewed in accord with *AMJ*'s normal review process and criteria. Prospective contributors wishing further information may contact Bob Hinings at (403)492-3054, Alan Meyer at (607)255-7134, or Anne Tsui at (714)856-4062.

SPECIAL RESEARCH FORUM CALL FOR PAPERS: METHODOLOGICAL ISSUES IN MANAGEMENT RESEARCH

The *Academy of Management Journal* is pleased to announce a call for papers for a Special Research Forum on Methodological Issues in Management Research. Guest co-editors for this forum are Jean Bartunek, Philip Bobko, and N. Venkatraman.

The purpose of this special research forum is to encourage the development and application of innovative methodologies, innovative uses of traditional methodologies, and/or a more effective understanding of current methodologies applied to management research. The goal of this Special Research Forum is to stimulate approaches to the discovery of knowledge about organizations, thereby serving as a catalyst to future research in management.

Submissions must be methodologically focused on issues considered relevant to *management* inquiry. While statistical analysis is an important facet of research projects, this forum will not be devoted to describing the derivation of new statistics. In keeping with the *Journal*'s empirical focus, submissions must be data-based. The topics considered should seek to demonstrate how a particular methodological orientation enhances (sharpens) our understanding in a substantive management content domain. Additionally, submitted manuscripts may demonstrate new facets of methodology and their applicability. Submissions that integrate across multiple methodological or disciplinary boundaries are particularly encouraged.

Examples that would fit the domain of this forum include a discussion of the limitations of LISREL applications in management research with substantive demonstration of problems or solutions; illustrations of how ethnographic methodologies can inform more traditional laboratory or questionnaire research (or the converse); the effects on both construct measurement and the resultant nomological net of correlations of different philosophical perspectives (e.g., about what difficulty means in goal-setting research or what effectiveness means for organizations); demonstrations of the use of discourse analysis and deconstruction in management research; the overlapping measurement needs for the research areas of organizational values, ethics, and performance appraisal. These illustrations are designed solely to spark creativity, not to constrain the types of methodology addressed.

In preparing manuscripts, authors should follow standard *AMJ* requirements specified in *AMJ*'s "Style Guide for Authors." Cover letters should request that papers be considered for this Special Research Forum. Five copies should be sent to Professor Michael Hitt, *Academy of Management Journal*, College of Business Administration, Texas A&M Univrsity, College Station, Texas 77843-4221. Papers must be received no later than September 1, 1992. All submissions will be blind reviewed in accord with *AMJ*'s normal review process and criteria. Prospective contributors wishing further information may contact Jean Bartunek at (617)552-4006, Philip Bobko at (908)932-3565, or N. Venkatraman at (617)253-5044.

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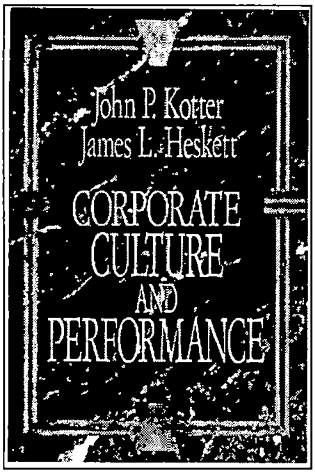

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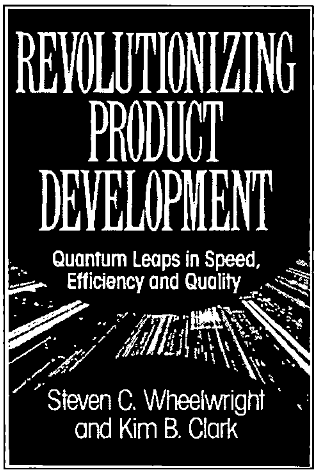

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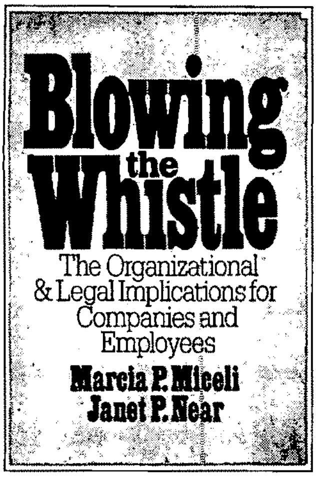
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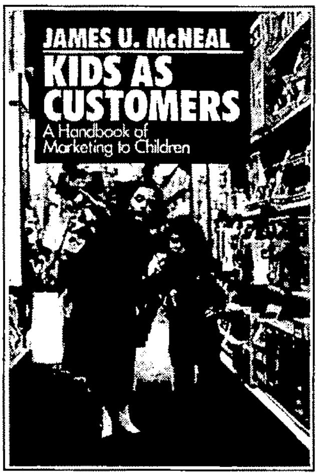

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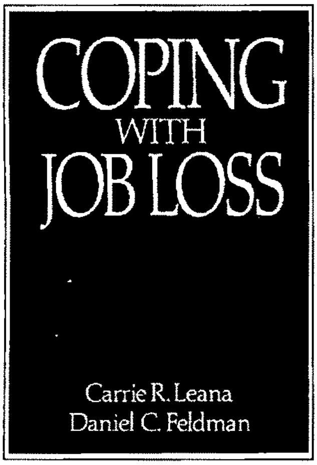

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Change in Editorial Policy

It gives me great pleasure to announce a revision in the editorial aims and scopes of the *Journal of Business Venturing*. As you can see from the new subheading, we have substantively increased the scope of the Journal.

This expansion in scope was prompted by the result of the survey which this journal has initiated and reported every two years under the subhead, "Delineating a Forum for Entrepreneurship Scholars," last published in Volume 6, Number 2, 1991. In this survey, the Journal emerged as an undisputed leader in the strictly entrepreneurially oriented journals. Only *Management Science, Academy of Management Review, Administrative Science Quarterly,* and *Academy of Management Journal* were rated higher, none of which are focused strictly on entrepreneurship research.

We made a decision to expand scope, augment the number of pages per issue, and at the same time encourage our editorial board to increase the expectations of article quality. The result is two major changes:

The journal scope has been extended in two directions:

a. First, we are now prepared to accept a select number of rigorous theoretical pieces. By this we mean nonempirical articles, very solidly based in theoretical argument, that draw from the disciplines of finance, economics, and organization theory to build the theoretical foundations of entrepreneurship research.

b. Second, we have multiplied the subject areas acceptable to the Journal. Our fundamental interest has been expanded to embrace a wider area, that of wealth creation. Therefore, we are interested in empirical articles that have to do not only with entrepreneurship and corporate venturing but with evolution and management of technology and industry evolution.

We have also enlarged the size of the Journal, from 80 to 96 pages per issue. If submissions continue to grow, it is our intention to further expand the size of the Journal.

Ian C. MacMillan, Editor

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From the Editor

One of the exciting and positive tasks with *AMJ* is working with the committee to select the outstanding article published in *AMJ* the previous year. It provides an opportunity to work with highly talented and dedicated colleagues and to review again the excellent research conducted by our colleagues in the management field. The committee to select the outstanding article published in the 1991 volume of *AMJ* was composed of Tom Bateman (North Carolina), Kathy Eisenhardt (Stanford), Luis Gomez-Mejia (Arizona State), Lynn Isabella (Virginia), and Doug Wholey (Carnegie Mellon). Tom Bateman served as the chairperson of this committee. As in past years, their task was not a simple one because there were many excellent articles. There was considerable diversity of article topics, as is usual with *AMJ*, and much high-quality work as well. As a result, it was difficult to select one outstanding article from the many high-quality pieces published in *AMJ*. However, this dedicated group read all of the 1991 *AMJ* articles and, after a thorough process, selected one to receive the award. Of course, we formally recognized the authors of this article at our annual Academy of Management meetings in August. In addition, I take this opportunity to congratulate the authors of the outstanding article published in the 1991 volume (pp. 517–554):

Jane E. Dutton and Janet M. Dukerich
"Keeping an Eye on the Mirror:
Image and Identity in Organizational Adaptation"

Congratulations, Jane and Janet, on an outstanding article and for the contributions it makes to management theory and practice. It is an excellent piece of work. Additionally, I want to thank the committee members for their hard work, dedication, and efficiency with which they accomplished their task. Thank you Tom, Kathy, Luis, Lynn, and Doug. Additionally, I want to congratulate all of the authors whose work was published in the 1991 volume of *AMJ*. The committee had a difficult time selecting one article from the many excellent ones published in this volume.

Also, I want to thank all who continue to contribute to the success of *AMJ*. Their names are obviously too numerous to mention, but they include the authors who submit their work for review, Editorial Review Board members, ad hoc reviewers (who will be recognized in our December issue), staff persons, readers of the *Journal*, officers and members of the Board of Governors of the Academy, and many others. The support that we receive continues to be gratifying. Also, your constructive feedback is always welcome. Our goal is to continue to publish one of the top journals in our field, and thus, I hope that you will continue to consider *AMJ* as a primary outlet for your scholarly empirical research in management. There is excellent research being conducted in our field, and I am pleased that we have the opportunity to publish some of the most important of this work.

Michael A. Hitt

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ACQUIRING ORGANIZATIONAL LEGITIMACY THROUGH ILLEGITIMATE ACTIONS: A MARRIAGE OF INSTITUTIONAL AND IMPRESSION MANAGEMENT THEORIES

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ROBERT I. SUTTON
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This article links institutional and impression management perspectives in a process model of how controversial and possibly unlawful actions of members of organizations can lead to endorsement and support from key constituencies. This model is grounded in interview, archival, and observational data concerning eight illegitimate actions attributed to members of two social movement organizations. We found that institutional conformity and decoupling illegitimate activities from legitimate structures facilitated spokespersons' efforts to use impression management tactics that shifted attention away from the controversial actions and toward the socially desirable goals endorsed by broader constituencies. As a result, these organizations used publicity generated by illegitimate actions to obtain endorsement and support from those constituencies. We discuss the implications of the model for other kinds of organizations and derive testable propositions. We also consider implications for institutional and impression management theories.

Organizations that seek to be recognized by a wide set of groups and individuals that will provide endorsement and support sometimes encounter a vexing predicament. If those organizations adhere closely to societal norms, they are unlikely to repel outside groups and individuals that can provide endorsement and support. Yet, because conformity produces organizations that are not distinct from most others, such organizations may not be noticed by crucial outsiders. Conversely, if such organizations openly violate societal norms, they are more likely to be noticed, but outsiders are unlikely to provide endorsement and support to organizations that defy

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We wish to thank Thomas D'Aunno, Blake Ashforth, Jan Kees Elsbach, D. Charles Galunic, Linda Ginzel, Thomas J. Kosnik, Douglas McAdam, John Meyer, Keith Murnighan, Walter Powell, Mark Snyder, Andrew Van de Ven, Scott Wilder, and Mayer Zald for helping us to develop the ideas in this work. We are especially grateful to W. Richard Scott and the members of his doctoral seminar for providing some painful but useful comments on an earlier version of this article. We also wish to thank the Stanford Center for Organizations Research and Stanford University's Office of Technology Licensing Research Incentive Fund for supporting this study.

widely accepted standards for behavior. In this study, we considered how two radical social movement organizations acquired legitimacy in the face of this predicament.

The notion that an organization will be rewarded for having a legitimate reputation is a ubiquitous theme in organizational theory (Ashforth & Gibbs, 1990; Lipskey, 1968; Zald, 1978). Legitimacy is conferred when stakeholders—that is, internal and external audiences affected by organizational outcomes—endorse and support an organization's goals and activities. And an organization can be described as legitimate when it is endorsed and supported by a segment of society large enough to ensure its effectiveness and survival (Pfeffer & Salancik, 1978: 194). Pfeffer and Salancik pointed out that, because an organization need only be endorsed and supported by some rather than all segments of society, it can remain legitimate in the face of external attacks. Nonetheless, acquiring and maintaining legitimacy are chronic difficulties for most organizations, regardless of how widely recognized they are or how widely supported they have been in the past.

The expectations of current and potential organizational participants, as well as the expectations of powerful external actors, about what constitutes legitimate means and ends are often conflicting, vague, and in flux (Meyer & Rowan, 1977). If key actors become dissatisfied with an organization's actions, they may retract endorsements of organizational goals or activities. Dissatisfaction may also lead such actors to reduce the quantity or quality of their participation in the organization or to demand more resources in exchange for continuing the same level of participation (Pfeffer & Salancik, 1978).

Institutional theorists have contended that organizations facing conflicting, inconsistent demands about what structures and practices they ought to use can maintain legitimacy by adopting designs that mask or distract attention from controversial core activities that may be unacceptable to some key constituencies. Meyer and Rowan (1977) proposed, for example, that by adopting visible structures that conform to social norms and by decoupling those structures from less acceptable core activities or goals, organizations can enhance the legitimacy conferred by powerful actors, even when their core practices and goals conflict with those desired by such actors. In addition, by using socially acceptable procedures to carry out controversial activities, organizations can maintain the impression that they are rational and legitimate even when such activities clash with social norms or organizational goals (Scott, 1987).

Institutional theory provides a useful but incomplete view of how organizations cope with conflicting, inconsistent demands. In addition to adopting visible and institutionalized structures and practices that mask or distract attention from controversial activities, organizations use spokespersons to provide positive interpretations of controversial actions (Pfeffer & Salancik, 1978: 194). These interpretations include using impression management tactics (Schlenker, 1980) to portray structures and actions in ways intended to garner endorsement and support. Thus, a greater understanding of how organizations acquire and protect legitimacy may be gained by blending institutional and impression management perspectives.

Existing writings hint that such an integration might be useful. Meyer and Rowan (1977) discussed how institutionalized structures and practices can be used in the accounts that managers provide to external constituencies. For example, they observed that using econometric analysis to justify organizational projects is an institutional norm, and that "such analyses can also provide rational accountings after failures occur: managers whose plans have failed can demonstrate to investors, stockholders, and superiors that procedures were prudent and that decisions were made by rational means" (Meyer & Rowan, 1977: 350).

This example implies that using institutionalized practices helps managers justify their actions and bolster their excuses. Justifications and excuses are impression management techniques (Tedeschi & Reiss, 1981). Yet past work has not explicitly woven together institutional and impression management perspectives. This article is an initial step toward such an integration. We propose a process model (Mohr, 1982) describing how institutional conformity of structures and procedures and the decoupling of illegitimate activities from legitimate structures set the stage for the use of impression management tactics.

We induced this model from a study of two radical social movement organizations, Earth First! and the AIDS Coalition to Unleash Power (ACT UP). Radical social movement organizations call for fundamental social change and exhibit rhetoric and tactics that "are widely viewed as unconventional, inappropriate, or illegitimate" and "are widely perceived as threatening" (Haines, 1988: 197). The model we developed is based on interviews, observations, and archival data about eight widely publicized actions attributed to members of Earth First! and ACT UP. We found that such illegitimate activities create legitimacy dilemmas for these organizations. On the one hand, culturally illegitimate activities can provoke negative comments and attacks that drive away members and jeopardize outside support. On the other hand, the resulting publicity can bolster an organization's reputation within the very narrow segments of society that endorse such controversial actions. Furthermore, such publicity, if managed correctly, can indirectly lead the organization to acquire legitimacy from those relatively broad segments of society that support its culturally acceptable goals. As a result, the survival and effectiveness of such organizations hinge partly on violating widely held norms to gain endorsement and support from a sufficiently large segment of society. Our study suggests that the two organizations we studied accomplished this delicate balancing act by combining organizational design features identified by institutional theorists with verbal accounts identified by impression management theorists.[1]

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[1] The perspective proposed here is related to, but distinct from, past work by social movement theorists on the antecedents of legitimacy for organizations, including sympathetic by-

(continued)

Following the logic of induction, we first describe the methods used in this research and then explicate the process theory grounded in these data. This process theory is most apt to generalize to other radical social movement organizations. But this research also has broader implications. Thus, we then consider implications for more traditional organizations, for developing testable propositions, and for refining institutional and impression management theories.

METHODS

Earth First! and ACT UP

Earth First! and the AIDS Coalition to Unleash Power (ACT UP) were studied in the fall of 1990. We chose these organizations because they relied on illegitimate actions to gain recognition and achieve goals, because the media attention they received provided extensive data, and because they could be classified as organizations. We must note, however, that Earth First! literature asserts that it is not an organization and thus can have no members. Yet, we consider Earth First! to be an organization and Earth First!ers to be its members because it has many trappings of an organization. Its fund-raising, media, and direct action committees indicate that a differentiated social structure is used to achieve collective goals. Mailing lists of people affiliated with Earth First! are maintained, and most people on such lists describe themselves as Earth First!ers. And local chapters operate under the Earth First! banner. ACT UP, which describes itself as an organization, has these same trappings. We considered studying other collections of social activists, like People for the Ethical Treatment of Animals (PETA), but chose not to because it was less clear that they were organizations. For example, most local groups loosely affiliated with PETA did not carry the PETA name, and members did not describe themselves as PETA members.

Earth First! was founded in 1980. There were over 15,000 Earth First!ers in more than 100 local groups in the United States and abroad in the period

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stander publics (Turner, 1969), the presence of extremists (Haines, 1988), and even a highly educated audience (Olsen, 1968). Social movement theorists have also defined some dilemmas for legitimacy in such organizations. For example, Piven and Cloward (1977) argued that legitimacy gained through support from outside constituents constrains and delimits the impact of social protest and that social movement leaders should focus on organizational goals without compromise. On the other hand, Lipskey (1968) proposed that social movement organizations divide up public roles so as to simultaneously appeal to opposing audiences, including the media, organization members, reference publics, and the targets of protest.

Although these theorists have considered structural solutions to legitimacy dilemmas, they have not explicitly used data about organizations to induct institutional or impression management theory, nor have they posited the integration of structural strategies with impression management tactics. Furthermore, although we refer to theory and research on social movement organizations where pertinent, and the addition of impression management theory is a contribution to the literature on such organizations, this study was intended primarily as a contribution to the more general literature on organizational theory.

studied. Earth First!'s espoused mission is to preserve and expand wilderness areas and to protect animals and plants in these areas. Members advocate the philosophy of "deep ecology," in which the human role in ecosystems is seen as no more or less important than that of trees. Earth First!'s philosophy of action is summarized by their credo: "No compromise in defense of mother earth!" and is manifested in "monkeywrenching" (Manes, 1990: 175), or performing visible and potentially unlawful actions designed to slow the destruction of the wilderness. As Earth First!'s founder, Dave Foreman, put it: "We're sticking a wrench in the system, we're slowing it down, we're thwarting it, we're kicking it in the face!" (Manes, 1990: 189). Monkeywrenching includes tree-spiking—driving metal spikes into live trees and marking the trees to warn loggers that cutting the tree is dangerous—sabotaging logging machinery, by, for instance, pouring sugar into bulldozer gas tanks, and blocking logging roads.[2] These actions have led others to label Earth First! a radical and even a terrorist organization.

ACT UP, an organization devoted to activism on AIDS (Acquired Immune Deficiency Syndrome), was founded in 1987. It had 20,000 members in over 50 local groups in the United States and abroad in the period studied. A large portion of its members are from the gay and lesbian communities. Members are "committed to direct action to end the AIDS crisis" (ACT UP, 1990: 1). Their demands include increasing government funds for AIDS research, education, and treatment, opening access to experimental drugs, lowering treatment costs, and the participation of people with AIDS in decisions on drug trials. ACT UP also seeks to end hostile and discriminatory actions against people with AIDS and to improve their self-image. The visible and possibly unlawful direct actions used by ACT UP members include occupying the offices of drug company executives and government officials, disrupting church services, and defacing property with stickers and red paint symbolizing the blood of AIDS casualties.

The members of both organizations studied are from diverse ethnic groups and socioeconomic classes. Both organizations are composed of loosely coupled, independently governed, local chapters guided by locally determined goals and tactics. These chapters use consensus decision making to determine group actions. Both organizations maintain local and national newsletters. Financial support for both comes mostly from donations, and sales of T-shirts, bumper stickers, and buttons.

Data Sources

Semistructured interviews. Seven informants were interviewed from five Earth First! chapters, and nine were interviewed from two ACT UP chapters. We contacted two Earth First!ers who declined to be interviewed. All informants from ACT UP whom we invited to be interviewed chose to do so. The Earth First! informants had been members for from three months to ten years. The ACT UP informants had been members for from six months to three years. At least one informant from each organization had been an active member since its founding.

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[2] The lyrics of this Earth First! ditty summarize the spirit and content of monkeywrenching:

> You grab a wrench, I'll get the Karo syrup,
> Picks and shovels and wire cutters too,
> Iron filings and sugar for the gas tank,
> Then I'll show you what we're gonna do.

We interviewed at least one member of each organization in the following categories: (1) a very active member engaged in a high degree of direct action, (2) a very active member engaged in a low degree of direct action, and (3) a moderately active member engaged in a low degree of direct action. We sought to interview informants from each category to obtain a range of views on these organizations' actions and legitimacy. We used initial phone conversations with potential informants to fill out the categories, asking them how active they were in the organization and how much they participated in direct action events. When we needed more informants for a given category, we asked if they knew someone in that category who might talk to us. We stopped interviewing additional informants for each organization when we began hearing the same information repeated again and again, following Glaser and Strauss's concept of "theoretical saturation" (1967: 61–62).

Informants were open and helpful during interviews. But ACT UP members more readily disclosed information about illegitimate events. This openness may have occurred because ACT UP members did not use methods, like tree-spiking, that could endanger others. ACT UP members may also have been more open because many carried the virus widely considered to cause AIDS, and some suffered AIDS symptoms. As a result, they believed that their only choice was to "fight or die."

The semistructured interview was based on a working framework developed prior to the data collection. We initially used a pilot interview form and then edited it to reflect refinements in our framework and to reduce repetition. The final interview consisted of 41 open-ended questions. We also pursued unexpected, but interesting, issues that arose because this was an inductive study. All but three interviews were recorded and transcribed; detailed notes were taken during all interviews. Interviews averaged 90 minutes and ranged from 20 minutes to three hours.

We began the interviews by discouraging informants from revealing any previously unknown information about illegal activities that they or other members might have taken. The Human Subjects Committee at our university encouraged us to provide this warning because, as Van Maanen put it: "There is absolutely no legal protection guaranteed to the social scientist on the grounds of research confidentiality" (1983: 245). As a result, despite our resolve to protect informants' confidentiality, it was important to warn informants that we could be forced to testify against them.

Questions concerned organizational history, use of direct action and its effect on an organization's reputation, organizational structure, and informants' experiences with and feelings about the organization and its actions. Questions focused on four widely reported and controversial actions that had been attributed to members of each organization. We asked informants how those events affected the organization and its reputation. They were also asked about their interactions with and feelings about outside groups, including corporations, government agencies, law enforcement agencies, other activist groups, the courts, the general public, the media, and politicians. We were able to cover all prepared questions in most interviews. It was not always necessary to ask each question because an informant's answers to prior questions often addressed subsequent questions. Moreover, because we had had advance warning that one informant could speak to us for only about 20 minutes, we prepared a brief interview that focused on the controversial events.

Records data. These data included newspaper and magazine articles covering organizational history, videotapes of television programs, books by members, and a complete set of newsletters for Earth First! These sources discussed the illegitimate events we examined in detail. Articles from local (e.g., the *San Jose Mercury News*) and national (e.g., the *New York Times*) newspapers, as well as local television news, provided information about media reactions to events. Interviews in popular (e.g., *Newsweek*) and environmental (e.g., *Buzzworm*) magazines provided information about the long-term consequences of the events. Books by prominent members of the two organizations provided insights into nuances of the events, especially the reactions of organizational leaders and spokespersons (Foreman, 1991; Kramer, 1989; Manes, 1990).

Observation of ACT UP meetings. The first author attended three weekly meetings of an ACT UP chapter. These three-hour meetings were open to the public. A rotating coordinator planned the agenda for each meeting and led discussion. All people attending a meeting (including the first author) introduced themselves and stated their affiliations. These meetings provided valuable information about organizational structure, past events, and strategies for upcoming events.

Illegitimate Events

Data analyzed from the three sources focused on four illegitimate events attributed to Earth First!ers and four illegitimate events attributed to ACT UP members. These events were discussed in detail by informants and were the subject of extensive discussion in media sources. Table 1 provides a brief description of each event.

We chose events that appeared, at least initially, to be likely to have negative consequences for an organization's legitimacy. Each event involved one or more illegitimate actions that were attributed to organization members, and each violated widely held social norms about how organizations and their members ought to behave.

DATA ANALYSIS

We used an iterative approach of traveling back and forth between the data, pertinent literature, and emerging theory to develop our model. This

TABLE 1
Illegitimate Events Attributed to Members of ACT UP and Earth First!

Organization	Illegitimate Event	Date
ACT UP	Disruption of filming of an episode of the "Midnight Caller" TV show that depicted a bisexual man with AIDS who was deliberately infecting women	10/20/88
	Golden Gate Bridge shutdown by AIDS activists that was largely attributed to ACT UP	1/31/89
	Disruption of a service at St. Patrick's Cathedral in New York City; some activists were accused of desecrating communion wafers	12/10/89
	Shouting down of the secretary of the U.S. Department of Health and Human Services, Louis Sullivan, at the Sixth International Conference on AIDS in San Francisco	6/24/90
Earth First!	A tree-spiking, commonly attributed to Earth First!; a lumber worker's saw blade hit the spike, which seriously injured him	5/8/87
	National Day of Protest against the U.S. Forest Service; included monkeywrenching, office takeovers, and demonstrations	4/21/88
	Arrest of four Earth First! members, caught in an alleged rehearsal run for the sabotage of a nuclear facility in Arizona	5/30/89
	Arrest of Earth First! members for blocking road and tree-sitting during Redwood Summer protests in northern California	6/90–9/90

method draws on descriptions of how to generate grounded theory by Glaser and Strauss (1967), Miles and Huberman (1984), and Eisenhardt (1989). We made hundreds of comparisons between the emerging model and the data and used those comparisons to guide judgment calls about the evolving model. We met frequently to discuss the emerging framework before, during, and after the data gathering. Following Miles's (1979) recommendation, we focused our early meetings on developing a rough working framework to bring clarity and focus to the questions asked informants, information gathered from records, and notes taken at meetings. The most important decisions we made at this juncture were to focus on a small set of direct action events attributed to members of each organization, on how the interpretation of each event was managed, and on the implications of each event for the organization.

Our meetings during the field study focused on adjusting plans about what data should be gathered to ground the emerging framework and on refining the framework. After the interviews had been completed, but not transcribed or analyzed, we reviewed the literatures on social movement organizations, institutional theory, impression management, and legitimacy. We then developed a substantially more explicit version of our working framework. It emphasized that many of the actions that led to legitimacy for these radical organizations also could threaten their legitimacy. This early model focused on how decoupling illegitimate actions from more legitimate structures enabled spokespersons to claim the organization wasn't blameworthy.

We then made more systematic comparisons between the data and emerging model. The approach used for comparing evidence across events was based on Miles and Huberman's (1984) methods for identifying similarities across sites and events. Our analysis of the three data sources indicated that, in addition to decoupling strategies, displays of institutional conformity were associated with illegitimate events. We also observed that the accounts used by spokespersons often referred to and were logically dependent on decoupling and institutional conformity.

Our decision to focus on the processes following specific illegitimate events was the key turning point at this juncture. We developed four tables, or "displays" (Miles & Huberman, 1984), to document the extent to which elements of the model could be grounded in each data source. Constructing these displays entailed reviewing evidence from all three data sources pertinent to each of the eight illegitimate events. We constantly tinkered with the model to align it with new evidence we encountered and with insights that we had as we constructed the displays and wrote the associated text. The displays provide useful information about the empirical grounding of the model. Nonetheless, like any other means of reducing and showing qualitative data in tables, they cannot convey the richness of the data.

Media sources and informant descriptions were examined to obtain data about how the sequence of events unfolded after each of the eight illegitimate events. We developed a time line for each event to capture information about the order in which central elements in the model were evident in reporters' observations, organizational spokespersons' statements, and informants' descriptions. Although there was variation in how rapidly or slowly subsequent events unfolded after each focal event, we found that the order in which events unfolded was fairly consistent across the eight examples. Early versions of the sequence were refined as a result of these analyses.

In addition, for each event, we counted and dated all mentions of criticism and of endorsement and support from organizational stakeholders in three mainstream newspapers that covered the events closely: the *New York Times, Los Angeles Times,* and *San Francisco Chronicle.* This analysis was conducted to provide evidence about differences between initial and delayed reactions to these events in mainstream media sources. We combined information from these three newspapers with evidence from media sources that provided less complete and consistent coverage (e.g., the *San Jose Mercury*) and from more biased environmental and AIDS newsletters that only provided endorsement and support. Together, the sources revealed reactions to the events from environmental and AIDS activists, as well as from government officials, politicians, corporations, and religious leaders. As a result of this analysis, we found not only reasonable grounding for the proposed elements, but also evidence to ground and shape the development of a process model.

A PROCESS MODEL OF HOW MEMBERS' ILLEGITIMATE ACTIONS CAN LEAD TO THE ACQUISITION OF ORGANIZATIONAL LEGITIMACY

Figure 1 summarizes the process model that resulted from our analysis of the eight illegitimate actions attributed to members of ACT UP and Earth First![3] The model focuses on the media's representation of illegitimate events because television, radio, magazine, newspaper, and newsletter reports were the primary avenues through which these social movement organizations communicated to external audiences and received support or criticism from such audiences. As a result, media reports facilitated and revealed the processes ACT UP and Earth First! used to gain legitimacy and provided evidence about the reactions to such processes from stakeholders, including government officials, politicians, corporate spokespersons, and the general public.

The first step in the process model is an illegitimate action by organization members that generates media attention. Initial media reports commonly contain criticisms of the organizations associated with an event. On December 10, 1989, for example, 111 ACT UP members were arrested when they disrupted mass at St. Patrick's cathedral in New York City. Cardinal O'Connor denounced the noisy protest immediately (Associated Press, 1989). The second step occurs when media representatives encounter two design features of an organization: institutional conformity and decoupling (Meyer & Rowan, 1977). Institutional conformity involves displaying visible organizational structures and practices that are isomorphic with those of

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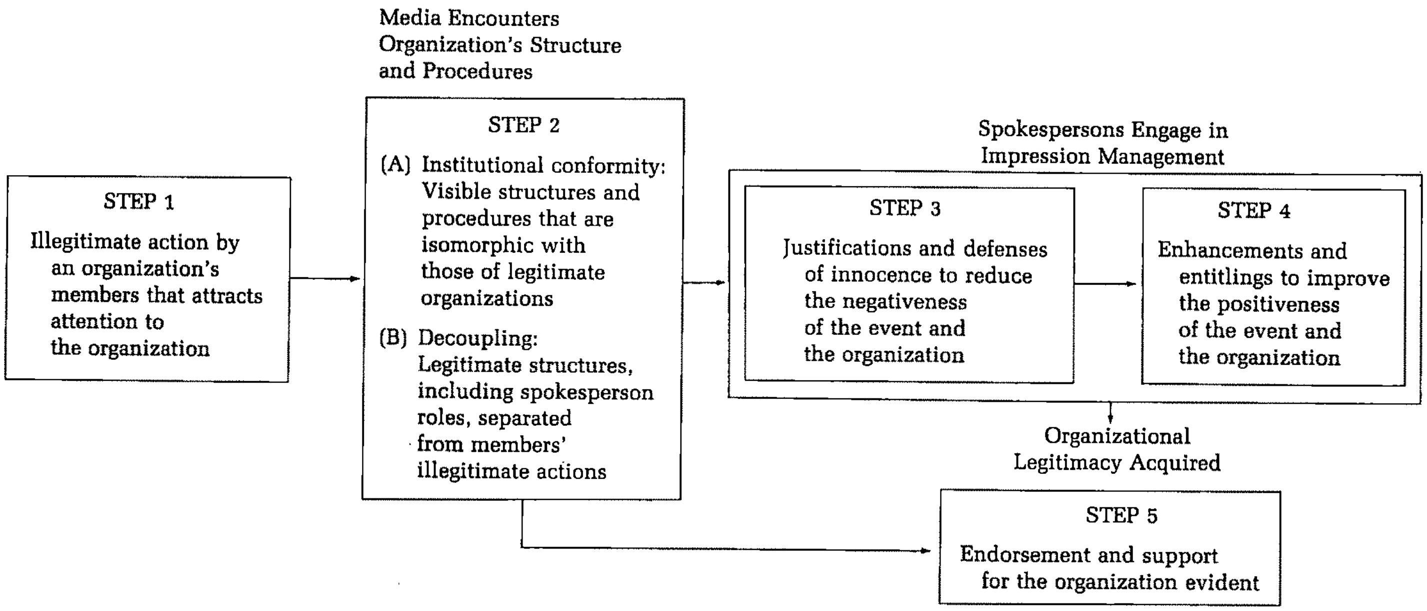
[3] The proposed model fits Mohr's (1982) definition of a process theory, not that of a variance theory. First, it tells a story about how the outcome of acquired legitimacy comes about. It does not seek to explain variation in organizational legitimacy. Second, it comprises discrete events and states, not variables. For example, the decoupling of legitimate structures from illegitimate actions and structures is a state rather than an independent or intervening variable. Similarly, acquired organizational legitimacy is a state rather than a dependent variable. If this were a variance theory, the model would focus on predictor variables, such as degree of decoupling, and on dependent variables, such as degree of legitimacy. Third, as in a story, the order of events in a process theory is always essential. For example, justifications and defenses of innocence must occur before enhancements and entitlings in the model. In contrast, variance theories are often less, or not at all, concerned with the causal ordering of variables. Fourth, each event or state in the model is a necessary, but not sufficient, condition for the outcome to occur. For example, the occurrence of an illegitimate activity is a necessary step in the sequence of events through which legitimacy is acquired, but it alone does not lead to legitimacy. We propose that the illegitimate activity marks the beginning of a probabilistic process that may lead to the acquisition of legitimacy. In contrast, if this were a variance theory, and we proposed that the occurrence (compared to the absence) of illegitimate actions predicted legitimacy, we would have viewed this categorical variable as an "efficient cause" necessary and sufficient to bring about the acquisition of legitimacy.

FIGURE 1

A Process Model of How Illegitimate Actions by Members of Radical Social Movement Organizations Can Ultimately Lead to Acquired Organizational Legitimacy


STEP 1
Illegitimate action by an organization's members that attracts attention to the organization
Media Encounters Organization's Structure and Procedures
STEP 2
(A) Institutional conformity: Visible structures and procedures that are isomorphic with those of legitimate organizations
(B) Decoupling: Legitimate structures, including spokesperson roles, separated from members' illegitimate actions
Spokespersons Engage in Impression Management
STEP 3
Justifications and defenses of innocence to reduce the negativeness of the event and the organization
STEP 4
Enhancements and entitlings to improve the positiveness of the event and the organization
Organizational Legitimacy Acquired
STEP 5
Endorsement and support for the organization evident

legitimate organizations in an institutional environment. This conformity implies that the organization and its spokespersons are credible, rational, and legitimate. Thus, on December 10, 1989, ACT UP spokespersons from the New York chapter claimed that the St. Patrick's Cathedral protest was designed to be nonviolent and peaceful and that the event was well publicized in advance to warn churchgoers (Reilly, 1989).

Decoupling involves separating legitimate organizational structures and practices from members' illegitimate actions. It is achieved through the use of independent affinity groups or anonymous individuals who carry out illegitimate actions but are not formally linked to an organization. Decoupling also protects, and may enhance, organizational legitimacy by allowing spokespersons to distance the organization and its legitimate goals from the illegitimate actions of members or subgroups of members. On December 11, 1989, spokespersons for San Francisco ACT UP chapters announced that the St. Patrick's Cathedral protest was an independent action by the New York chapter and had been carried out without their approval (Associated Press, 1989).

Institutional conformity and decoupling set the stage for impression management used in the third step. Institutional conformity and decoupling increase the overall credibility of spokespersons' interpretation and pave the way for two specific impression management tactics: defenses of innocence and justifications. Defenses of innocence are claims that one is not responsible for an event or that the event did not occur (Schlenker, 1980). Spokespersons can defend their organization's innocence by asserting that it did not endorse the illegitimate action—citing decoupling—and thus isn't responsible. Justifications are claims that an event was not "bad, wrong, inappropriate, or unwelcome" (Tedeschi & Reiss, 1981: 7) because of the positive outcomes it led to or the extreme circumstances it was performed under. Institutional conformity makes more plausible justifications that shift attention away from the socially undesirable actions of a few members and toward the socially desirable goals of all members. For example, spokespersons may claim that experts endorsed the action or that members tried normative and legitimate procedures before resorting to illegitimate actions. Thus, on December 17, 1989, gay and lesbian community spokespersons claimed that the St. Patrick's Cathedral action was necessary because peaceful negotiations with church officials had not produced satisfactory changes in their policy toward safe sex and AIDS (Hunter & Servalan, 1989).

Defenses of innocence and justifications shift attention away from negative aspects of an event and toward positive aspects of the event and the organization considered responsible, setting the stage for "enhancements" and "entitlings" used in the model's fourth step. Enhancements are attempts to improve the perceived merit of an event (Tedeschi & Reiss, 1981). Spokespersons typically emphasize the progress made toward socially desirable goals as a result of illegitimate actions. Entitlings are attempts to gain credit for a desirable event (Tedeschi & Reiss, 1981). Spokespersons may assert that the organization deserves credit for the action because of the socially desirable goals that it achieved. On December 25, 1989, a journalist knowledgeable about AIDS claimed that ACT UP had made profound changes in drug policies, and an ACT UP spokesperson took credit for these changes, claiming that his organization would continue to "take charge" of the situation (Shilts, 1989).

Acquiring organizational legitimacy is the fifth and final step. It results from the influence of both design features and impression management tactics. Design features allow an organization to attain credibility as rational and gain distance from members' illegitimate actions. Defenses of innocence and justifications extend this distance and shift attention away from illegitimate means and toward legitimate ends. Enhancements and entitlings draw further attention to these legitimate ends and lead to endorsement and support from the fairly broad segments of society that may support the organization's goals. Thus, three weeks after the St. Patrick's Cathedral action, a January 3, 1990, *New York Times* article called ACT UP "effective" in changing drug policies and reported endorsements from the New York City health commissioner and the director of the National Institute for Allergy and Infectious Disease (DeParle, 1990).

We explicate this model and the evidence that guided its development below.

Step 1: Illegitimate Action

The performance of an illegitimate act by an organization member or members is the first step in the model. There was evidence that members of ACT UP or Earth First! had carried out all eight actions intentionally, although many of the actions were not endorsed by all members or chapters of these organizations. And many of the actions have not been unequivocally linked to ACT UP or Earth First! members. But all have been attributed to ACT UP or Earth First! members and all received at least local endorsement by members of these organizations. For example, the disruption of the Louis Sullivan speech at the Sixth Annual International Conference on AIDS involved extensive planning by members of ACT UP and included their setting up an elaborate media center to communicate with journalists from across the country (Tuller, 1990). Similarly, the Redwood Summer protests planned and carried out by Earth First! chapters were timed to raise awareness prior to a California election in which several environmental propositions were on the ballot.

Illegitimate actions of this kind can provide media recognition for social movement organizations and their goals. Media recognition is essential for organizations that are challenging social norms and attempting to influence public opinion (Oberschall, 1973). Media recognition is most easily gained through large-scale or dramatic actions that portray the associated organization as a credible "player" in the protest movement (Gamson, 1990). The resulting publicity may lead a wider segment of society to know about the organization, creating a potentially larger segment that can provide endorsement and support. Thus, ACT UP and Earth First! members frequently asserted that illegitimate actions led to media reports of their organization's goals. A member's letter to the *Earth First!* journal asserted that the tree-spiking incident resulted in such attention:

> The bottom line here is that as a result of all this unfavorable coverage regarding spiking, people in the West Coast are acutely aware of the crisis that exists with our forests, and our role in trying to prevent it (Johnson, 1987: 7).

An Earth First!er we interviewed remarked:

> The major result of ecotage has been to raise the stakes and raise the issues that were being ignored, and in a sense, sensationalizing issues in a way the media would pay attention to. You fire a torpedo and you have your banner hanging on the torpedo.

Similarly, an ACT UP member summarized the impact of the Louis Sullivan disruption:

> We get our message out in the media and we do it in such a way that it's colorful, it's creative, it's confrontational, it's tense. And it has all the ingredients that they love. That the media loves, that the T.V. camera loves, and politicians hate to be confronted with.

Yet illegitimate actions create a dilemma because such violations of social norms can damage legitimacy. Controversial actions may drive away current and potential members, jeopardize endorsement and support from outside constituencies, and provide ammunition for adversaries who seek to undermine an organization's reputation. Theorists have contended that conformity to institutional norms about acceptable organizational behavior is essential for attaining organizational legitimacy (Dowling & Pfeffer, 1975; Meyer & Rowan, 1977). Damaging property and blocking roads clearly violates such norms. Backlash to illegitimate actions can range from harassment and loss of public support to arrests and covert action by the Federal Bureau of Investigation (FBI; Gamson, 1990). Thus, organizations with members that use illegitimate actions can gain recognition among a broad segment of society that can provide endorsement and support. But these organizations also risk developing a negative image that can lead to reduced endorsement and support. We next describe how ACT UP and Earth First! appeared to accentuate the benefits of illegitimate actions by using a blend of design features and impression management tactics.

Step 2: Signs of Institutional Conformity and Decoupling

Figure 1 shows that after organization members carry out an illegitimate action, the media encounter organization structures and procedures that conform to institutional norms and structures that separate the formal organization from members' illegitimate actions. Spokespersons highlight these structures and procedures to convey that their organization is rational, credible, and legitimate. Table 2 indicates that, for all eight events studied, the media encountered institutional conformity and decoupling.

Institutional conformity. By conforming to institutionally defined norms about how to organize, organizations may obtain legitimacy. As Meyer and Rowan wrote:

> Vocabularies of structure that are isomorphic with institutional rules provide prudent, rational, and legitimate accounts. Organizations described in legitimated vocabularies are assumed to be oriented to collectively defined, and often collectively mandated ends. . . . On the other hand, organizations that omit environmentally legitimated elements of structure or create unique structures lack acceptable legitimated accounts of their activities. Such organizations are more vulnerable to claims that they are negligent, irrational, or unnecessary (1977: 349).

ACT UP and Earth First! conformed to such institutionalized rules, specifically through structural conformity, procedural conformity, and personnel conformity (Scott, 1987).

First, structural conformity entails adopting widely used organization charts, departments, and job classifications. For example, ACT UP had separate media committees that produced news releases, made press contacts, and worked closely with other committees. Because they had close links with the media, such committees were usually the first contacted by the press after an illegitimate action. For example, after the "Midnight Caller" filming disruption, a media committee held press conferences and voiced demands in concert with several other AIDS activist groups. Similarly, Earth First! often assigned a credible spokesperson to an action or had a media committee set up to provide information about it. Thus, Earth First! cofounder Mike Roselle was assigned to talk to the press after the tree-spiking incident. An informant told us:

> Mike Roselle was actually in transit and called in and heard that it had happened and ended up stopping at a phone booth and calling up the media from the phone booth. And he, at that time, was one of the key spokespersons in the Bay Area.

These credible spokespersons and media committees conveyed to outsiders that their organizations had normative structures for distributing information that were much like presidential press departments and corporate public relations departments.

Second, procedural conformity entails adopting "institutionally defined technologies specifying means-ends chains an organization is to follow in order to realize desired objectives" (Scott, 1987: 196). These organizations achieved procedural conformity by carrying out illegitimate actions in a professional or normative manner. For example, ACT UP tried peaceful ne-

TABLE 2
Cross-event Evidence of Institutional Conformity and Decoupling[a]

a. Evidence

Events	Institutional Conformity	Decoupling
ACT UP		
Disruption of "Midnight Caller" filming	i, R	r
Golden Gate Bridge shutdown	i, R	I, R
Disruption at St. Patrick's Cathedral	i	I, r
Disruption of Louis Sullivan's speech at AIDS conference	R	I, m
Earth First!		
Tree-spiking that led to injury of lumber worker	I, r	I, R
Day of National Protest against the U.S. Forest Service	i, R	i, r
Alleged rehearsal run for nuclear plant sabotage	r	r
Redwood Summer protests and monkeywrenching	i, R	i, R

b. Examples

Organizations	Institutional Conformity	Decoupling
ACT UP	ACT UP's extensive use of negotiations with TV producers prior to the disruption of the "Midnight Caller" filming and use of press conferences after protests to voice demands	The Golden Gate Bridge action was performed by a separate affinity group, SANOE, created especially for this action
Earth First!	Earth First! spokespersons expressed sympathy for an injured worker following the tree-spiking incident; stated that they advocated marking all spiked trees and thus doubted an Earth First!er was responsible for the incident	Earth First! spokesperson asserted that tree-spiking was done by individual Earth First!ers acting alone and not as part of an organized group

[a] I = strong evidence from interviews, i = modest evidence from interviews; R = strong evidence for records data, r = modest evidence from records data; M = strong evidence from organizational meetings, m = modest evidence from organizational meetings.

gotiations with the producers of "Midnight Caller" before resorting to more confrontational tactics.[4] Similarly, Earth First! publications advocated carrying out tree-spiking in a standardized manner that protected loggers from physical harm. All spiked trees were to be clearly marked and timber companies were to be notified of areas that had been spiked. This procedural conformity led an informant to comment about the spike that injured a timber worker:

> I don't think Earth First! is responsible for that spike. That spike wasn't a typical Earth First! sort of spiking. The people in Earth First! who spike tend to do it in the way that Dave Foreman said to do it in *Eco-defense*, marking the tree and notifying all the proper authorities.

Third, personnel conformity entails filling roles with members that have qualifications, education, and certification that are isomorphic with the institutional environment. For ACT UP and Earth First!, such credible personnel included expert members—wildlife experts, AIDS experts, lobbyists—who bolstered organizational legitimacy by providing informed opinions about AIDS or environmental issues. As a result, when outsiders interacted with the organization, they spoke with members who were credible experts.

These three kinds of institutional conformity protected ACT UP and Earth First!'s legitimacy because they signaled that the organizations were prudent and rational. Moreover, as explained later, such conformity indirectly influenced legitimacy by implying that organizational spokespersons were prudent and rational, increasing the credibility of their impression management tactics. Thus, spokespersons often highlighted institutional conformity in their accounts of illegitimate actions.

Decoupling strategies. Although institutional conformity in structures and procedures signaled that ACT UP and Earth First! were rational and credible, it would have been difficult for these organizations to gain legitimacy with a sufficiently broad segment of society to ensure survival if they had been linked too strongly to members' illegitimate actions. To deal with this problem, organization spokespersons decoupled legitimate structures and procedures from members' illegitimate actions. In this way, the legitimate structures could exist without interfering with members' controversial activities. As Meyer and Rowan noted, "Decoupling enables organizations to maintain standardized, legitimating, formal structures while their activities vary in response to practical considerations" (1977: 357).

The ability of these organizations to decouple illegitimate actions from legitimate structures and still maintain their identities as organizations was due partly to the loose coupling within and between the local chapters. Weick (1976) defined loosely coupled systems as those in which component entities are responsive to each other but do not hold any important variables in common and are able to maintain their own identities. Both ACT UP and Earth First! appeared to fit this definition. Individual chapters of both organizations could take stands that the other chapters or organization leaders did not support. In addition, within local chapters, special interest groups existed, concerned, for instance, with women's issues, animal rights issues, or people of color issues, that dictated their own agendas and tactics and required no endorsement from the larger organizations. As a result, loose coupling was an enduring structural feature that made the periodic decoupling of members' actions from these organizations easier to accomplish and explain.

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[4] Earth First! did not usually engage in legitimate actions prior to carrying out illegitimate actions because a primary justification for their actions was that other environmental groups had been using legitimate actions for years without success. Thus, they argued that legitimate predecessors to their actions had already been carried out by other groups.

Members of both ACT UP and Earth First! decoupled illegitimate actions from formal organizational structures by performing these actions as anonymous individuals or as part of "affinity groups," or temporary, independent groups of individuals, that operated under names other than ACT UP or Earth First! Five of the eight illegitimate actions we examined were carried out by individuals or affinity groups. Other actions were decoupled by claims that individual chapters had carried them out without national endorsement. In one instance, a group of ACT UP members, along with other AIDS activists, formed an affinity group called Stop AIDS Now or Else (SANOE) to shut down the Golden Gate Bridge. This arrangement allowed them to carry out illegitimate actions without directly linking them to ACT UP. As one informant put it,

> A group like ACT UP that has public meetings couldn't plan something like that. There was no other way to do it but to form a whole different group. That way, the whole group [i.e., ACT UP] can say that, if an affinity group did it, that group is responsible.

A published report also indicated that:

> SANOE recruits by invitation only, and requires the total trust and secrecy of its members. . . . Each SANOE action is performed by an independent chapter, although the same people, coincidentally enough, seem to appear. The chapter usually disbands after its titled action (Whiting, 1990: B3).

Other actions carried out by specialized subgroups included the Louis Sullivan disruption, the alleged nuclear plant sabotage, and some actions during the Redwood Summer protests. Tree-spiking was usually carried out by individuals. One informant asserted that individuals did most monkeywrenching without notifying the organization, and that Earth First!ers wanted it that way.[5]

Spokespersons often highlighted such decoupling in their efforts to protect their organization's image. Earth First! founder Dave Foreman defended his organization by claiming that Earth First! was not responsible for the tree-spiking incident. He asserted:

> I'm sure that individual Earth First!ers have spiked trees in California, but they have been doing it as individuals, not as an organized group (Champion, 1987: 1).

Foreman went on to justify the event:

> It's unfortunate this worker was injured . . . but the real destruction and injury is being perpetrated by Louisiana-Pacific and the Forest Service in liquidating old growth forests (Champion, 1987: 1).

These examples suggest that, in addition to separating a formal organization from members' illegitimate actions, decoupling sets the stage for spokespersons to use impression management techniques, such as defenses of innocence and justifications, that attenuate the negative meaning of the actions. The success of these impression management tactics may reflect, in part, the success of institutional conformity and decoupling in improving the credibility of the organization and in distancing it from illegitimate events. We describe these tactics in detail next.

Step 3: Spokespersons Use Defenses of Innocence and Justifications

As Figure 1 indicates, after the media contacted Earth First! or ACT UP about an illegitimate event, spokespersons provided interpretations portraying the event and organization in a positive light. These interpretations are impression management tactics (Schlenker, 1980; Tedeschi & Reiss, 1981), defined as efforts to attenuate the negative meaning and accentuate the positive meaning of events linked to an actor. Actors facing predicaments use these tactics in "situations in which events have undesirable implications for the identity-relevant images actors have claimed or desire to claim in front of real or imagined audiences" (Schlenker, 1980: 125).

The eight actions examined here created predicaments for ACT UP and Earth First! These threats to organizational reputation included the public outrage after the Louis Sullivan disruption and the tree-spiking incident. Actors facing predicaments use "accounts," or explanations, to improve their public image (Scott & Lyman, 1968; Schlenker, 1980). Table 3 shows that ACT UP and Earth First! spokespersons routinely used two types of accounts: defenses of innocence and justifications.

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[5] Moreover, Earth First! spokespersons also used a tactic closely related to decoupling to avoid collective responsibility for individual actions. Even though, as we documented above, Earth First! had numerous organizational trappings, spokespersons routinely claimed that because Earth First! was a movement rather than an organization, it had no members and thus couldn't be held responsible for the actions of any individuals. Thus, rather than just claiming that the particular action was decoupled from the organization, spokespersons claimed that no actions could be linked to the organization because it didn't exist.

Defenses of innocence. These accounts were attempts to reduce or eliminate an organization's construed responsibility for an event and included defenses of noncausation ("it wasn't my fault") and defenses of nonoccurrence ("it really didn't happen") (Schlenker, 1980). ACT UP and Earth First! relied most heavily on defenses of noncausation because the decoupling of structures from illegitimate events enabled spokespersons to claim that the organization was not responsible.

Thus, as previously mentioned, Earth First! spokespersons used claims of noncausation after the tree-spiking incident because the action was carried out by anonymous individuals and was not formally endorsed by Earth First! Furthermore, spokespersons claimed that the lack of procedural conformity in the incident indicated that Earth First!ers were not responsible:

> Earth First! representatives replied to the charge by denying responsibility for the spiking, noting that environmentalist tree spikers always inform timber companies about their spiking activities, the point being not to harm workers but to prevent logging. There had been no notification in the Cloverdale incident, and, moreover, the spiked tree was a second-growth redwood, not virgin timber of the type Earth First! seeks to protect (Manes, 1990: 11).

ACT UP used a defense of noncausation in the Golden Gate Bridge shutdown. Spokespersons asserted that SANOE, a separate group, was responsible. They also refuted claims that the disruption of the Louis Sullivan speech was a racist act by emphasizing that a People of Color Caucus led the action. One informant argued,

> That was a major media faux pas. The media screwed up badly because a national People of Color Caucus started the disruption and the media never let that out. All the media showed was white people attacking a black. A lot of people of color thought we were racists and I directly blame the media.

This incident also had elements of a defense of nonoccurrence, because ACT UP asserted that the reported racist action did not, in fact, take place.

In sum, both Earth First! and ACT UP spokespersons used defenses of innocence to distance the formal organizations from illegitimate actions and thereby protect their organizations' legitimacy. In addition, spokespersons from both organizations used references to decoupling and institutional conformity to bolster the credibility of these defenses of innocence.

Justifications. These accounts are "attempts to minimize or deny the undesirable nature of a predicament-creating event" (Schlenker, 1980: 137).

TABLE 3
Cross-event Evidence of Impression Management[a]

a. Evidence

Events	Defenses of Innocence	Justifications	Entitlings	Enhancements
ACT UP				
Disruption of "Midnight Caller" filming	r	R, i	R	R, i
Golden Gate Bridge shutdown	I	I, R	R	I, R
Disruption at St. Patrick's Cathedral	i	I	i	I, r
Disruption of Louis Sullivan's speech at AIDS conference	I, m	R	I	I, R
Earth First!				
Tree-spiking that led to injury of lumber worker	I, R	R	R	I, R
Day of National Protest against the U.S. Forest Service		R	I, r	i, R
Alleged rehersal run for nuclear plant sabotage	I, R	R	i, R	I, R
Redwood Summer protests and monkeywrenching		R	I, R	I, R

b. Examples

Event	Defenses of Innocence	Justifications	Entitlings	Enhancements
Earth First! tree-spiking incident	Claims that lumber firms withheld evidence to make Earth First! look more guilty and that lumber firms planted the spike	Justifying tree-spiking as the only means left to meet the challenge of "ecocide"	Claims that the modest environmental reforms gained by mainstream environmentalists were the result of publicity from monkey-wrenching	Pointing to interviews with the injured mill worker, in which he agreed with Earth First!'s demands to end clear-cutting

[a] I = strong evidence from interviews, i = modest evidence from interviews; R = strong evidence from records data, r = modest evidence from records data; M = strong evidence from organizational meetings, m = modest evidence from organizational meetings.

ACT UP and Earth First! spokespersons minimized or denied the negativeness of illegitimate events by claiming they were not as negative as they seemed, that other legitimate actors had performed or endorsed similar actions, and most often, that the ends justified the means. Thus, when Earth First! was criticized for spiking trees, spokespersons asserted that spiking only hurt ruthless corporations, that these actions were similar to the Boston Tea Party, and that a 1,000-year-old tree was worth more than timber company profits. Spokesperson Mike Roselle argued,

> We're getting down to the last trees. The actions we take now have to be effective, because we're not going to get a second chance (Diringer, 1989a: A8).

Similarly, ACT UP spokespersons justified the "Midnight Caller" disruption as necessary for preventing violence against people with AIDS:

> The whole vigilante tone of the film will lead to the death of our people (Walsh, 1988: A6).

Another ACT UP spokesperson commented:

> We're not trying, at any time, to not allow freedom of speech. We only have objections when "freedom of speech" can cause genocide, prejudice, or violence against any community (Marquart, 1988a: 7).

Radical tactics may also be justified if earlier attempts at orderly settlements were unsuccessful (Gillespie, 1983). ACT UP justified its disruption of the "Midnight Caller" filming as the only option left after negotiations with the producers had failed. ACT UP spokespersons said they had been misled about changes in the script and that the producers refused to delete references to irresponsible sexual behavior, which "angered activists who said the gay community has acted responsibly and altered their behavior to avoid infecting themselves and others" (White, 1988: 20). Thus, ACT UP's use of procedural conformity—using legitimate tactics before resorting to illegitimate ones—helped spokespersons to justify illegitimate actions.

In sum, illegitimate actions by ACT UP and Earth First! members were justified as necessary to save human lives and the life of the planet since all previous actions had failed. Justifications of this kind, which shift attention from means to ends, are especially useful for organizations that pursue culturally acceptable goals but use illegitimate actions to achieve them. Furthermore, by shifting attention to the positive ends achieved by such actions, justifications set the stage for enhancements and entitlings.

Step 4: Spokespersons Use Enhancements and Entitlings

Although they used justifications and defenses of innocence to reduce the negative meaning of illegitimate events and to protect organizational legitimacy, spokespersons turned to enhancements and entitlings to highlight the positive changes brought about by the illegitimate actions and to claim credit for these changes. Table 3 indicates that ACT UP and Earth First! spokespersons routinely used these two impression management tactics to present events and the people responsible for them in a positive light.

Enhancements. Spokespersons tried to enhance members' illegitimate actions by asserting that those actions ultimately benefited the larger society. ACT UP claimed that their protests were responsible for lowering the prices of drugs used by AIDS patients and that actions like the Louis Sullivan disruption increased access to experimental drugs for all people with AIDS. Similarly, Earth First! spokespersons claimed to have helped the entire environmental movement by making other environmental groups look less radical.[6] They also claimed to have improved the earth for all people by preserving irreplaceable forests. As Earth First! lawyer and spokesperson Gerry Spence said of the alleged nuclear plant sabotage:

> The FBI acted as if [it was] dealing with the most dangerous, violent terrorists that the country's ever known. And what we're really dealing with is ordinary, decent human beings who are trying to call the attention of America to the fact that the earth is dying (Manes, 1990: 195).

Assertions that illegitimate actions created awareness and education were also common enhancements. Earth First! spokespersons claimed that environmental issues would be absent from the front pages if not for monkeywrenching. One informant noted about the tree-spiking incident:

> It gave us a chance to say "That [action] was done wrong. If it would have been done right, it wouldn't have been a danger to people." We could say, "You know, there are other things you can do to help save forests." It also gave us a chance to talk [to the media] about the issue of why somebody might have gone out and spiked a tree. It gave us a chance to say, "Hey, there are only 4 percent of the redwoods left."

Entitlings. Extending Tedeschi and Reiss's (1981) definition to the organizational level, we defined entitlings as efforts to increase the responsibility attributed to an organization for an event. Spokespersons used entitlings by claiming that the favorable outcomes of an action would not have been realized without their organizations' members and often blended entitlings with enhancements. For example, after many groups had argued that changes in the "Midnight Caller" script were necessary, and after major script changes had occurred, ACT UP spokespersons claimed that those changes would not have occurred if their members had not disrupted the filming. ACT UP members also asserted that, without their protests, no activists could have reviewed the script and even minor changes would not have been made. One reporter summarized his interviews with ACT UP spokespersons:

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[6] Social movement theorists describe the negative and positive consequences of radicals and their actions for moderates as "radical flank effects" (cf. Haines, 1988).

> Several pointed out that without protests, the show might have been an even worse portrayal of the AIDS health crisis and gay life (White, 1988: 4).

Similarly, Earth First! spokespersons claimed that their members deserved credit for improving Earth First!'s relations with mill workers and law enforcement agencies despite negative propaganda by timber companies during the Redwood Summer protests:

> While lumber company PR types and the corporate press were whipping up a frenzy of anticipation over the likelihood of violence, Redwood Summer organizers held meetings with timber company mill workers and law enforcement agencies, defusing tension and educating them about non-violence (*Earth First!*, 1990b: 1).

Similarly, ACT UP informants claimed that the success of the Louis Sullivan disruption was due in part to their use of an elaborate media network set up to communicate to the press and other media around the world. As one reporter put it,

> The high-tech sophistication of ACT UP's media apparatus for this week's event is a telling illustration of just how far the group has come since its founding in New York three years ago (Tuller, 1990).

Entitlings were also used for events that were not enhanced, or where enhancements were weaker. For example, Earth First! spokespersons claimed that the harassment and negative reactions they received from corporations and law enforcement agencies only meant their protests had been effective. As Dave Foreman remarked about the alleged nuclear sabotage incident:

> I'm proud to be here facing harassment by the FBI. I think I'm here because I've been effective in bringing attention to the crisis on the planet (Manes, 1990: 193).

Step 5: Organizational Legitimacy Is Acquired

The final step in our process model is the acquisition of legitimacy for organizations whose members carry out illegitimate actions. According to Pfeffer and Salancik's (1978) conceptual work, legitimacy is acquired when there is endorsement and support for an organization from audiences that are crucial to the organization's reputation and viability. Positive statements by spokespersons of credible organizations, financial or technical support from outside constituents, and increased organizational membership for

ACT UP and Earth First! were all signs that legitimacy had been conferred. Tables 4 and 5 summarize the endorsement and support that followed each of the eight illegitimate events we examined. This evidence suggests that ACT UP and Earth First! spokespersons were often successful in their attempts to divert attention away from the negative aspects of the events through defenses of innocence and justifications and could then shift the focus of attention toward the more socially acceptable goals and accomplishments of the organizations through enhancements and entitlings.

External endorsement and support were sometimes directly tied to a particular illegitimate event. For example, a *San Francisco Examiner* editorial praised the changes that ACT UP brought about in the "Midnight Caller" script:

> Thanks to the persistence of the activists . . . a few laudable messages are telegraphed to the audience (Dougan, 1988: C2).

A *San Francisco Chronicle* reporter described endorsements that Earth First! received for its Redwood Summer protests that were designed to save American trees and jobs:

> The messages provoked blasts from the air horns of passing trucks . . . some of them accompanied by friendly thumbs up (Bancroft, 1990: A27).

More often, however, endorsement and support were linked to the culturally acceptable and legitimate goals of these organizations rather than to specific illegitimate events. For example, shortly after ACT UP members' disruption at St. Patrick's Cathedral, the *New York Times* printed a story lauding ACT UP's key role in hastening the availability of new AIDS drugs:

> Another word that describes ACT UP is effective. Pressure by the group has not only helped keep the epidemic in the news, it has also helped bring major changes to the way the Federal Government tests and distributes experimental drugs, allowing patients to obtain them much faster (DeParle, 1990: A12).

Even New York City's health commissioner, Dr. Stephen C. Joseph, a former target of ACT UP's protests, expressed support for the organization:

> There's no doubt that they've had an enormous effect, . . . we've basically changed the way we make drugs available in the last year (DeParle, 1990: A12).

Similarly, Earth First! was recognized as an effective force in the environmental movement in a *Los Angeles Times* story after the nuclear plant sabotage incident. Brock Evens, vice president for national issues at the Audubon Society, remarked:

> I honor Earth First! for having the guts to do the things they do. It's not for me, but I understand why they do what they do. And ultimately we all help each other (Lerner, 1990: 10).

TABLE 4
Cross-event Evidence of Endorsement and Support for ACT UP Following Illegitimate Events

Events	Evidence of Endorsement or Support
Disruption of "Midnight Caller" filming	San Francisco's mayor praises the protestors and their goals (Ford, 1988)
	San Francisco mayor's press secretary endorses the action (Easton, 1988)
	"Midnight Caller" producers make initial amendments to the script and say they have heard "responsible viewpoints" from some of the protestors (Linebarger, 1988)
	Protestors from the San Francisco AIDS Foundations and the Mobilization Against AIDS join ACT UP in negotiations with "Midnight Caller" producers (*Los Angeles Times*, 1988)
	Several articles in San Francisco gay, lesbian, and other local newspapers endorse the actions of ACT UP (Cice, 1988; Marquadt, 1988a, b; Whelan, 1988)
	"Midnight Caller" crew members express empathy with the activists (Waltes & Morch, 1988)
	San Francisco television critic endorses the actions (Dougan, 1988)
	Bay area newspaper editorials endorse the actions and goals of ACT UP members (*San Jose Mercury News*, 1988; Kirp, 1988)
Golden Gate Bridge shutdown	San Francisco gay and lesbian newspaper gives "wholehearted" endorsement of the action (Marquadt, 1989)
	California congresswomen Barbara Boxer and Nancy Pelosi express empathy towards the protestors and endorse ACT UP's goals (Linebarger, 1989)
	Motorists honk in approval during one-year anniversary march (Ward, 1990)
Disruption at St. Patrick's Cathedral	Women's Health Action and Mobilization joins ACT UP in the protest (De Curtis, 1989)
	New York City mayor Ed Koch supports ACT UP's right to speak out about the AIDS crisis, despite his disagreement with the action itself (Reilly, 1989)
	Local gays and lesbians espouse support for the goals of ACT UP in New York newspaper article (Hunter & Servalen, 1989)
	AIDS journalists credit ACT UP with sharpening the focus on the AIDS crisis and with motivating new Food and Drug Administration and National Institute of Health programs to make AIDS drugs more available (Shilts, 1989)
	New York Times writer says ACT UP is effective in changing drug policy (DeParle, 1990)
	New York City health commissioner and the director of the National Institute of Allergy and Infectious Disease call ACT UP effective and constructive in changing drug policy (DeParle, 1990)
Disruption of Louis Sullivan's speech at AIDS conference	Delegates to the conference and a spokesperson from the Los Angeles County Department of Health Services endorse the action (Herscher & Olszewski, 1990)
	San Francisco paper prints editorial endorsing ACT UP and lauding its actions benefiting all people with AIDS (*San Francisco Chronicle*, 1990a)
	Federal health officials credit ACT UP with drug policy changes despite their controversial tactics (Liebert, 1990)
	Letters to the editor in San Francisco newspapers endorse the action (Dobson, 1990; McGuire, 1990)
	Spokespersons from the National Public Health Service and the National Institute of Allergy and Infectious Disease say they will retain ACT UP members on their boards after the incident (*San Francisco Chronicle*, 1990b)
	Informants from ACT UP report that office equipment loaned to them from private citizens enabled protests to continue during the conference
	Informants from ACT UP report a tripling in membership after the event

TABLE 5
Cross-event Evidence of Endorsement and Support for Earth First! Following Illegitimate Events

Events	Evidence of Endorsement or Support
Tree-spiking that led to injury of lumber worker	Newspaper article cites evidence of animal mutilations near the logging site and claims that police investigators suspected an individual cult member and not Earth First! (*Los Angeles Times*, 1987)
	The injured mill worker endorses Earth First!'s protests against clear-cutting in a telephone interview from his hospital bed. (Manes, 1990:12)
	Audubon Society spokesperson supports Earth First!'s defense of innocence (Scarce, 1990)
	Earth First! informants claim the event increased exposure and led to membership increases
Day of National Protest against the U.S. Forest Service	Earth First! informants reported that members of the Rain Forest Action Network and the Action Tree Council participated in and endorsed the actions
	Earth First! spokespersons claimed that media coverage pointed to inconsistencies between Forest Service policy and actions (Pickett, 1988)
	Washington Post article plays down the threat of Earth First! and gives credibility to their goals and protest questions (Sinclair, 1988)
Alleged rehearsal run for nuclear plant sabotage	Gerry Spence[a] provides pro bono legal support for Earth First! founder Dave Foreman, whom he claims was framed by the FBI (Diringer, 1989c)
	The FBI agent investigating the case praises Earth First! members for their dedication and effort in an accidentally recorded message (Bowden, 1990)
	Audubon Society vice president endorses Earth First!'s goals in a follow-up story (Lerner, 1990)
	Greenpeace publishes a sympathetic story concerning the incident (Berlet, 1990)
Redwood Summer protests and monkeywrenching	The Seeds of Peace and Brian Wilson of the San Francisco Center for the Practice of Nonviolence endorse the protests (Goldston, 1990)
	Some loggers in northern California express support for Earth First!'s goals of stopping clear-cutting and exporting logging jobs (Bancroft, 1990)
	California mainstream environmentalists and local northern California citizens express support for Earth First!'s goals (Diringer & Snyder, 1990)
	Support and participation in the protests by local ecologists (Kay, 1990)
	Over 2,000 demonstrators from across the state and nation show up for one protest (*Earth First!*, 1990d)

[a] This support was notable because Spence was famous for winning the Kerr-McKee vs. Karen Silkwood estate case.

The eight illegitimate events also provoked criticisms for the organizations and their members. Evidence from newspapers, magazines, and informants revealed negative reactions to ACT UP's actions, including: (1) restraining orders following the "Midnight Caller" disruptions (Johnson, 1988; Peters, 1988), (2) criticisms by journalists following the Golden Gate Bridge shutdown (*New York Times*, 1989; Stanley, 1989; Tuller, 1990), (3) denouncement by religious and political leaders following the disruption at St. Patrick's Cathedral (Associated Press, 1989; Henican, 1989; Lindner, Anataki, & Stone, 1989; Shilts, 1989; Weiser, 1989), and (4) criticism after the disruption at the Sixth International Conference on AIDS (Carter, 1990; Liebert, 1990; O'Loane, 1990; *San Francisco Chronicle*, 1990b).

Negative reactions to Earth First!'s actions included: (1) claims that Earth First!ers were trying to hurt loggers following the tree-spiking incident (Diringer, 1989a; Stammer, 1987), (2) tightened security at government offices following the national day of protest against the U.S. Forest Service (Pickett, 1988; Sinclair, 1988), (3) charges that Earth First!ers were terrorists following the nuclear plant sabotage incident (Diringer, 1989b; Feldman & Meyer, 1989; Foote, 1990), and (4) counterdemonstrations, harassment, and assaults on Earth First!ers following the Redwood Summer protests (*Earth First!*, 1990a,c; Garlington & Israel, 1990; Kay, 1990; *San Francisco Chronicle*, 1990c,d).

These negative reactions do not, however, undermine our assertion that ACT UP and Earth First! acquired legitimacy following these illegitimate actions. Two trends in the data corroborated our assertion. The first trend is that the audiences that gave endorsement and support were distinct from those that gave criticism. As Pfeffer and Salancik (1978) suggested, because an organization need only be endorsed and supported by a limited segment of society, it can remain legitimate in the face of external attacks. Thus, if an illegitimate action triggers some attacks from audiences that are not crucial sources of endorsement and support but also triggers an outpouring of endorsement and support from crucial audiences, the organization connected with the action has acquired—rather than lost—legitimacy.[7]

Endorsement and support for ACT UP came primarily from other AIDS and gay activist groups, politicians and journalists in San Francisco and New York, and scientists and other AIDS experts. These audiences were more crucial to ACT UP's effectiveness and survival than were religious leaders, corporations, and journalists outside of San Francisco and New York, all of which provided criticisms. Endorsement and support for Earth First! came from other environmental organizations, environmental experts, and environmental journalists. These audiences were more important to Earth First!'s effectiveness and survival than the law enforcement officials, lumber industry spokespersons, and Forest Service employees who provided the bulk of the criticisms. Thus, it appears that both of these organizations acquired legitimacy following illegitimate events because attacks came largely from irrelevant audiences while endorsement and support came largely from relevant audiences.

Furthermore, it is important to emphasize that even though unlawful and sometimes dangerous actions were linked to these organizations, much of the endorsement and support for their goals came from individuals and groups in the mainstream of society, not just from a few radical groups and individuals. For example, even though people throughout the San Francisco Bay Area were angry at ACT UP following the Golden Gate Bridge closings, a story printed three weeks later reported that local congresswomen Barbara Boxer and Nancy Pelosi expressed empathy for protestors who had contracted the HIV virus and support for ACT UP's goals. Similarly, expressions of support for Earth First!'s goals came from the Audubon Society, which is the oldest and most conservative environmental group in the United States, from the mill worker who was injured by the spiked tree, and even from one of the FBI agents who was investigating the alleged nuclear plant sabotage.

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[7] Moreover, attacks by a hostile audience can increase an organization's legitimacy when individuals and groups that are crucial sources of endorsement and support for the organization reject the views of the hostile audience. These attacks may be viewed as a sign that the organization is doing something right. For example, criticisms of Earth First! by lumber company officials appeared to enhance this radical organization's reputation among members of more moderate environmental groups such as the Sierra Club and the Audubon Society.

The second trend in these data suggesting the acquisition of organizational legitimacy after the illegitimate actions is that criticisms surfaced quickly in the media and focused on the illegitimate means used by members of ACT UP and Earth First!, but endorsement and support persisted after the criticisms had faded and focused on the legitimate ends these organizations sought to attain. We counted and dated all mentions of criticisms and of endorsements and support from organizational audience members in three mainstream newspapers that covered the eight events closely: the *New York Times, Los Angeles Times*, and *San Francisco Chronicle*. A total of 34 criticisms and 30 expressions of endorsement and support occurred in the 50 articles in these sources that concerned these eight events. These articles indicated that 79 percent of the criticisms (27 of 34) were reported within the first eight days after an event, and only 50 percent (15 of 30) of the endorsements and support came during the first eight days, with the remaining 50 percent coming after the eighth day. Thus, 64 percent of the reactions reported in the first eight days were negative, and 36 percent were positive. Conversely, 32 percent of the reactions reported after eight days were negative, and 68 percent were positive. In addition, 31 of 34 reported criticisms concerned illegitimate means, and only 3 concerned organizational ends. Conversely, all 30 expressions of endorsement and support concerned the organizations' more legitimate ends. For instance, after ACT UP's protest at St. Patrick's Cathedral, initial criticisms centered around the immorality of desecrating communion wafers; later endorsements focused on the effectiveness of ACT UP's tactics in changing drug policies. Likewise, after the nuclear sabotage incident, the terrorist nature of Earth First!'s actions was criticized at first, but the organization's goals and achievements in environmental preservation and education were ultimately praised. Thus, once the initial criticisms for the illegitimate means used by ACT UP and Earth First! had faded, the bulk of the remaining attention appeared supportive and focused on the legitimate ends that these organizations sought to achieve.

In summary, our model proposes that illegitimate actions by members of ACT UP and Earth First! were crucial first steps in a process that ultimately led to these organizations' acquiring legitimacy. As the *Los Angeles Times* summarized:

> If Earth First! poses a murky moral dilemma of ends justifying means, on a practical level the group must be judged by its

> effectiveness. There seems to be a growing, if somewhat tacit, consensus in environmental circles that, for all the trouble it has caused, Earth First! has had a positive impact (Lerner, 1990: 10).

BROADER IMPLICATIONS OF THIS RESEARCH

The model proposed here was induced from data about two radical social movement organizations. This model is most apt to generalize to other radical social movement organizations, but the extent to which it describes such organizations can only be determined by hypotheses testing research in large, representative samples. The strength of inductive research of this kind is in guiding and inspiring new ideas rather than validating existing ideas. In this vein, the model proposed here suggests several paths for future work that have implications beyond enhancing knowledge of radical social movement organizations. These broader implications include fueling insights about controversial actions associated with a wider range of organizations, providing a basis for testable propositions, and suggesting refinements in institutional and impression management theories.

Illegitimate Actions by Other Kinds of Organizations

The insight that social movement organizations use illegitimate actions to acquire legitimacy raises the question of whether other kinds of organizations also use illegitimate actions to gain or protect legitimacy. We examined cases of more traditional organizations that were associated with illegitimate or controversial actions to begin addressing this question. Our tentative conclusion was that the model is useful for understanding two kinds of situations in which illegitimate or controversial actions are associated with more traditional organizations.

First, the model appears to be useful for understanding how and why some traditional organizations may try to gain recognition or promote a new image by intentionally carrying out controversial actions that, although not unlawful, violate social norms. For example, Reebok International sponsored a controversial rock music tour supporting Amnesty International[8] to promote Reebok's image as a "cool" and "with it" company (Carton, 1988). Reebok's management viewed such sponsorship as a way to promote Reebok's "freedom of expression campaign" (the slogan was "let U.B.U.") and a means to gain increased visibility with young people (Hiller & Quelch, 1988). Reebok's association with the tour created controversy because many saw it as a sleazy marketing ploy, by a company with no prior human rights activities, designed to sell expensive shoes to poor young people throughout the world (MacPhearson, 1988).

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[8] Amnesty International is a worldwide organization fighting for human rights, as proclaimed in the Universal Declaration of Human Rights. They specifically work for the release and fair trial of people imprisoned for their beliefs, gender, color, ethnic origin, language, or religion.

Reebok responded by noting that the tour was underwritten by the Reebok Foundation, which had been created a year earlier to aid worthy humanitarian and educational organizations (Carton, 1988). These claims were apparently intended to show that Reebok's retail sales business had been decoupled from its sponsorship of the tour and that Reebok had, prior to the tour, engaged in structural and procedural conformity by setting up a separate foundation to support such causes. In addition, the firm's chief executive and other Reebok spokespersons used defenses of innocence against the criticisms that the tour was purely a marketing ploy, claiming that it was not designed to sell shoes and dovetailed with Reebok's long-established stance on freedom of expression (Carton, 1988). Furthermore, they justified the event as morally correct even if it did sell shoes. As one spokesperson put it, "What's so controversial about human rights?" (Miller, 1988: 6). Thus, it appears that Reebok used decoupling and institutional conformity to add credibility to the organization and its spokespersons while distancing the controversial actions from the formal organization, setting the stage for justifications and defenses of innocence.

Second, the model appears useful for understanding how traditional organizations deal with controversy surrounding illegitimate actions that they become associated with unintentionally. Examples include the Johnson & Johnson corporation's predicament when several people died from poisoned Tylenol capsules (Snyder & Foster, 1983) and Waldenbooks' recall of *The Satanic Verses* after the corporation received bomb threats for selling this book.

These examples suggest that our model may provide insights about how the images of these organizations were managed. To illustrate, Waldenbooks was criticized by the National Writers Union after discontinuing sales of *The Satanic Verses*, considered blasphemous by Islamic fundamentalists. Authors and independent book store owners criticized and picketed Waldenbooks stores, claiming the chain was sending a message that freedom of speech meant little because "any credible threat can banish, if not ban, a book" (Stern, Smith, & Quelch, 1990: 3). Waldenbooks' management responded with defenses of innocence and references to procedural conformity. They claimed that Waldenbooks had never stopped selling the book, that it wasn't currently available to customers because it was temporarily sold out, and that the company was waiting for new shipments from the publisher. These claims were apparently accurate. Although Waldenbooks had pulled the book from store shelves, it was sold through company stockrooms. Thus, because Waldenbooks conformed to procedural norms about fighting censorship by keeping controversial books available through their stockrooms, spokespersons' later defenses of innocence were more believable. In addition, Waldenbooks issued a newspaper statement that justified the removal of *The Satanic Verses* from store shelves because of concern for employee safety and claimed that their employees were entitled to praise for working despite bomb threats (Quelch, 1990). Thus, Waldenbooks used defenses of innocence, justifications, and entitlings, and used procedural conformity to set the stage for those tactics, even though they did not intentionally create the event that caused the controversy.

Developing Testable Propositions

These examples of organizational associations with controversial actions suggest that some of the conceptual links in our model might be tested not only in a large, representative sample of radical social movement organizations, but also in more diverse samples of organizations. Our model and supporting data suggest four propositions that might be especially promising for such empirical adventures.

First, the model suggests that decoupling may set the stage for later impression management tactics. In our discussion of defenses of innocence in step 3 of the proposed model, we described how ACT UP and Earth First! used separate affinity groups or anonymous members to carry out actions and how this decoupling facilitated spokespersons' later claims that their organizations were not responsible for the actions. Similarly, Reebok decoupled its sponsorship of the rock tour from shoe sales by using a separate foundation to run the tour. If decoupling had not been in place, spokespersons' later defenses of innocence concerning the marketing benefits of the tour would not have been as credible. The implication is the following:

> *Proposition 1: When a formal organization is structurally decoupled from members' illegitimate or controversial actions, spokespersons' subsequent use of defenses of innocence for those actions will be more successful in helping their organizations acquire legitimacy than they will be when such decoupling is not present.*

Second, the model suggests that procedural conformity may set the stage for subsequent justifications. For example, ACT UP spokespersons reminded reporters of their prior attempts to hold peaceful negotiations with the producers of the "Midnight Caller" television show when justifying their disruption of the filming. ACT UP spokespersons claimed the disruption was a last resort after institutionally normative actions failed to bring about the changes necessary to prevent further violence against people with AIDS. Because procedural conformity was followed in carrying out this and other actions, spokespersons could more easily make claims to the effect that "We had a good reason, we only carried it out after all legitimate possibilities were exhausted." The implication is:

> *Proposition 2: When an organization engages in procedural conformity by attempting to carry out legitimate actions before resorting to illegitimate actions, spokespersons' subsequent use of justifications for those illegitimate actions will be more successful in helping their organizations acquire legitimacy than they will be if such procedural conformity is not evident.*

Third, the model suggests that personnel conformity (Scott, 1987) sets the stage for certain kinds of justifications. We found that spokespersons may justify actions on the basis of other credible actors' performance or endorsement of similar actions. If credible actors are organization members, their endorsement adds legitimacy to the justifications used to defend illegitimate actions. Earth First! spokespersons often asserted that their philosophy of deep ecology was developed largely by Bill Devall, a sociologist and deep ecology "prophet." By retaining Devall as an advisor, Earth First! spokespersons gained credibility for their justifications of illegitimate actions. Similarly, many ACT UP members were on the boards of the Public Health Service and the National Institute of Allergy and Infectious Disease, and these individuals lent credibility to the organization's claims that inaction would cost thousands of lives. These data suggest a third proposition:

> *Proposition 3: When organizations employ credible personnel by retaining members who are experts in their fields, spokespersons' subsequent use of justifications for illegitimate actions endorsed by such experts will be more successful in helping the organizations acquire legitimacy than they will be if experts had not been retained and had not endorsed illegitimate actions.*

These first three propositions suggest that decoupling and institutional conformity make the subsequent use of impression management tactics more credible. The model also suggests links between different types of impression management tactics. Our data suggest that impression management tactics proceed from those that shift attention away from negative means to those that shift attention toward positive ends. If this shift is accomplished, organizations can use impression management to enhance and entitle those positive ends. If attention is not shifted to positive ends and is still focused on negative means, enhancements and entitlings are less likely to be effective in bringing about endorsement and support from crucial organizational audiences. Thus,

> *Proposition 4: When spokespersons are successful in using defenses of innocence and justifications to shift attention away from the negative means and toward the positive ends of illegitimate actions, their subsequent use of enhancements and entitlings for those actions will be more successful in helping their organizations acquire legitimacy than they will be when defenses of innocence and justifications fail to create such a shift in attention.*

Refining Institutional and Impression Management Theories

This research has implications for the separate developments of institutional and impression management perspectives, not just implications for combining these two perspectives. First, our findings bolster recent efforts to broaden institutional theory conceptions of individual self-interest in organizations. Institutional theorists have commonly deemphasized the role of self-interest and instead emphasized the role of social norms and institutionally defined structures and strategies when describing determinants of organizational form and function. Recently, however, such theorists have begun to recognize how individual actors influence institutions. DiMaggio (1988) described institutionalization as a political process in which the relative power of actors shapes the form of the resulting institution. Covaleski and Dirsmith (1988) proposed that individual actors in universities may influence the creation and maintenance of institutional expectations regarding policies and procedures in ways that meet their individual needs.

In this vein, our model emphasizes that, in loosely coupled organizations like ACT UP and Earth First!, individuals may influence when and how institutional norms are adhered to and when and how such norms are violated. We suggest that some actors influenced decisions to adhere to particular institutional norms at specific times in specific ways, while other actors influenced decisions to violate different institutional norms at specific times in specific ways. Organizational spokespersons may influence and practice adherence to institutionalized norms concerning structures or practices in order to legitimize their roles, meet personal needs for power and leadership, and facilitate the future use of justifications and defenses of innocence that may legitimize their organizations and themselves. In contrast, other, more radical members may influence and practice the violation of institutionalized norms concerning behavior for legitimate organizations. They do so to gain attention for their organizations and themselves, to gain a sense of personal power, and to gain legitimacy for their organizations and themselves with audiences that support such illegitimate actions.

This research contributes to work on impression management in two ways. First, although a substantial body of empirical work has begun to examine impression management at the individual level in organizations (cf. Giacalone & Rosenfeld, 1989, 1991), less work has examined impression management intended to preserve and enhance organizational images. This study adds to the small number of quantitative studies of attributions that have appeared in annual reports to corporate shareholders (Salancik & Meindl, 1984; Staw, McKechnie, & Puffer, 1983) and qualitative field studies (Dutton & Dukerich, 1991; Sutton & Callahan, 1987) suggesting that organizations and individuals have used strategies similar to those we have described to protect their images, to similar effect.

Second, this research has a longitudinal component that is typically absent from social psychological theory and research on impression management. As Ginzel, Kramer, and Sutton (1992) pointed out, this longitudinal component is missing because the impression management literature consists mostly of brief laboratory studies. The present research indicates that by introducing a longitudinal component, spokespersons may transform events that seem at first to be identity-threatening into events that ultimately protect and perhaps enhance an organization's image. Research might benefit from examining how and if similar transformations in individual images occur. In a related vein, little is known about the consequences of using different sequences of specific impression tactics. Our research suggests that, if defenses of innocence and justifications do transform organizational events from identity-threatening to identity-enhancing, then spokespersons can make successful use of entitlings and enhancements. Impression management research, including laboratory experiments, could examine whether such sequencing occurs and if it has a similar impact on individual images.

CONCLUSIONS

This article advances a process model describing how the illegitimate actions attributed to members of social movement organizations can ultimately lead to the acquisition of organizational legitimacy. It describes how spokespersons for two such organizations used accounts that included references to organizational structures and procedures to shape how external constituencies interpreted members' illegitimate actions. Our analyses of eight illegitimate events linked to ACT UP and Earth First! suggest a process in which spokespersons' impression management tactics actively shape constituencies' interpretations of illegitimate events and in which references to organizational design features, described in institutional theories, set the stage for spokespersons' use of these tactics by increasing the credibility of the interpretations that they put forward.

The primary conceptual contribution of this research is that it identifies specific links between institutional and impression management theories, thus taking an initial step toward integrating two perspectives that emphasize how people present favorable images to others. This research also suggests a broader, and rather unsavory, conclusion that might generalize to other settings: individuals, groups, and organizations that seek to gain legitimacy from their peers might accomplish this aim by first violating the norms held by their peers. The notion that, in order to persuade people to like you, your group, or your organization, you might start by taking actions designed to offend those people has troubling but intriguing implications for both theory and practice.

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INFLUENCES OF CAMPUS RECRUITING ON APPLICANT ATTRACTION TO FIRMS

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In the context of campus recruiting for organizational positions, this study examined the influences of recruiter behaviors and characteristics and interview focus and structure on applicants' attraction to firms. Recruiters and applicants completed surveys after campus interviews. We measured attraction to the firms as expectancy and valence perceptions. Results indicated that applicant perceptions of recruiter behaviors, especially the interest shown in candidates, had the strongest influence on attraction. In general, recruiters' reports of interview focus and structure were related to applicant perceptions of recruiter behavior, and interview focus was related to perceptions of the attractiveness of a job.

As shortages of workers have become prevalent, organizations are expending more effort in recruiting applicants (Rynes, 1989). Campus interviews are important vehicles in efforts to recruit college graduates. Researchers have suggested that perceptions of recruiter behavior and characteristics influence applicants' attraction to a particular organization (Harris & Fink, 1987; Rynes, 1991). Given the shortages of workers in certain occupations (Hanigan, 1987; Rynes, 1989) and the utility of having the most qualified applicants accept job offers (Murphy, 1986), studies of issues that influence applicant attraction to a firm seem warranted. In this study, we investigated how initial campus interviews influence applicant attraction.

In general, much less research has focused on organizational recruitment than on selection processes, partly because of the abundance of workers in labor markets in the past 15 years (Rynes, 1989). Not surprisingly, although researchers have focused on influences on interviewers' perceptions of applicants (see Harris [1989] for a review), comparatively little re-

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search has investigated influences on applicants' attraction to firms. Nonetheless, Rynes (1989) presented a model of the process of applicant attraction that postulated that a recruiter's focus in an interview influences recruiter behaviors that, in turn, influence applicants' expectancy and valence perceptions. The two foci in her model were recruitment, or selling the company, and selection—evaluating the applicant. In this study, we examined some of the processes Rynes discussed to investigate how recruiters influence applicant attraction to firms.

Recruiters may influence applicant attraction through influencing (1) applicants' expectations of receiving a job offer—their *expectancy perceptions*—or (2) the perceived attractiveness of the jobs: their *valence perceptions* (Rynes, 1989, 1991; Taylor & Bergmann, 1987). Recruiters can influence expectancy perceptions by behaving in a manner leading applicants to believe job offers will be forthcoming. Expectancy perceptions influence attraction in that applicants are more likely to pursue jobs by, for instance, going on second interviews, or making site visits when they perceive a high probability that such effort will lead to job offers (Rynes, 1989).

Recruiters can influence the perceived attractiveness, or valence, of a job through their behaviors, which applicants tend to interpret as signals about working conditions in a firm; a friendly recruiter is seen as indicating a warm, friendly work environment. In addition, recruiters influence attractiveness through providing applicants with information about job and organizational attributes. Finally, recruiters with certain characteristics might be perceived as having high organizational status, therefore making jobs appear more attractive (Rynes, 1989).

It seems likely that the focus of an interview, which can vary between evaluating the candidate and selling the company, and the amount of structure the interview has also influence applicant attraction to organizations. Rynes (1989), noting that interviews can be used as both selection and recruitment tools, included interview focus as a key factor in her model, suggesting that applicants react differently depending upon whether the interview is focused more on examining their qualifications (selection) or on selling the company (recruitment). Interview focus has not previously been studied. We expected the focus of interviews to influence how applicants perceived both recruiters and job attractiveness because of the different opportunities for applicants to present their strengths and to learn about important job and firm attributes. Similarly, on the basis of the same logic, we expected applicants to react differently to structured and unstructured interviews.

In summary, we investigated the extent to which recruiters' behaviors, their demographic characteristics, and an interview's focus and structure explain applicant attraction to interviewing firms. This study in part replicates previous research examining applicant attraction and extends prior efforts by including new measures of recruiter behaviors and specifically investigating whether interview focus and structure influence applicant perceptions of recruiters and attraction to organizations.

THEORY AND HYPOTHESES

Recruiter Behaviors

Recruiters may influence applicants' attraction to firms by influencing both their perceptions of the likelihood of receiving job offers (expectancy) and the perceived attractiveness of the jobs (valence). Evidence suggests that recruiters do play a key role in influencing applicant attraction to firms (Alderfer & McCord, 1970; Schmitt & Coyle, 1976), although some researchers have suggested that recruiters influence attraction only when applicants have minimal information about a job (Powell, 1984; Rynes & Miller, 1983). In campus interviews, perhaps because college students usually do have only minimal information about particular jobs, they use early contacts with recruiters to form impressions of firms (Behling, Labovitz, & Geiner, 1968). Further, recent evidence suggests that recruiter behaviors explain unique variance in applicants' likelihood of receiving and accepting job offers, beyond the effects of job attributes (Harris & Fink, 1987; Powell, 1991).

In the "elaboration likelihood model" of persuasive communication (Petty & Cacioppo, 1986), when the ability to process information is low, peripheral rather than central processing of information will occur. Whereas central processing involves careful examination of the information presented, during peripheral processing a person does not carefully scrutinize the information presented but instead is susceptible to simple cues in the environment, such as the attractiveness of the source of the information. Employment interviews are thought to elicit peripheral processing rather than central processing because applicants, who must answer questions while feeling somewhat anxious and stressed, cannot process information during interviews (Powell, 1991). Further, advocates of "critical contact theories" of job choice (e.g., Behling et al., 1968; Gerstner, 1966) have suggested that in campus interviews, because firms tend to recruit applicants similarly and applicants have little contact with firms, college students have difficulty differentiating among jobs. Thus, such applicants use contacts with the hiring firms to differentiate jobs (Behling et al., 1968). These arguments suggest that recruiters, who are salient environmental cues, will influence applicants in employment interviews.

Although some earlier research investigated whether perceptions of recruiters or of job attributes explained more variance in applicant attraction (e.g., Powell, 1984), we did not measure perceptions of job characteristics because of theoretical arguments (Behling et al., 1968; Petty & Cacioppo, 1986) and recent empirical evidence (Harris & Fink, 1987; Powell, 1991) indicating that recruiters are important influences on applicant attraction to firms at the campus interview stage. Therefore, we focused on investigating the effects of recruiter behaviors on applicant reactions (Wanous & Colella, 1989) in the context of a campus placement center.

> *Hypothesis 1: To the extent that job applicants have positive perceptions of a recruiter, they will have high expectancy and valence perceptions.*

Moderators of Effects of Recruiter Behaviors

In general, individuals with low self-esteem have been found to be more susceptible to environmental influences than their counterparts with high self-esteem (Brockner, 1988). Further, Brockner postulated in his "behavioral plasticity hypothesis" that the expectations of people with low self-esteem are more easily influenced than the expectations of people with high self-esteem. Therefore, we expected applicants' self-esteem to moderate the effects of recruiter behaviors on expectancy and valence perceptions.

Another potential moderator of the effects of recruiter behaviors is the amount of applicants' previous interview experience. Applicants who have experienced a number of interviews may be less influenced by recruiter behaviors because they are more able than other applicants to focus on important job and organizational attributes (Rynes, Heneman, & Schwab, 1980; Schwab, 1982). Harris and Fink (1987) found that, as they expected, recruiter informativeness had a stronger effect for applicants who had had relatively few interviews. Contrary to expectations, however, for applicants who had attended many prior interviews, recruiter personableness and competence had a stronger effect on attraction than it did for the less experienced interviewees. Harris and Fink noted that they tested a number of moderating effects and suggested that their findings may have been due to chance. Given prior theorizing (Rynes et al., 1980; Schwab, 1982) and the implications of the elaboration likelihood model (Petty & Cacioppo, 1986), we expected applicants who had experienced few previous interviews would be less able than their more experienced counterparts to process information during an interview and therefore would be more influenced by salient characteristics in the environment, such as recruiter behaviors.

> *Hypothesis 2a: Job applicants with low self-esteem will be more influenced by recruiters' behaviors than those with high self-esteem.*
>
> *Hypothesis 2b: Job applicants who have had few prior interviews will be more influenced by recruiters' behavior than those who have had many prior interviews.*

Recruiters' Demographic Characteristics

Recruiters' demographic characteristics may influence applicant attraction through influencing the perceived status of an interviewer, which in turn influences applicants' perceptions of the status of the job for which they are interviewing. For example, a recruiter's education level may cause applicants to conclude that a job has relatively high status, therefore influencing expectancy and valence perceptions (Rogers & Sincoff, 1978). We investigated the effects of recruiters' gender, age, education level, and organizational function.

As Powell (1987) pointed out, research investigating the effects of recruiter gender on applicant reactions to firms is needed. Gender may influence attraction to firms if, for example, applicants perceive that woman recruiters have less status and power and less clout in making job-offer decisions than men. Liden and Parsons (1986) found that although applicants saw woman recruiters as more personable and informative than men, the applicants rated the job less attractive when interviewed by women. Similarly, Taylor and Bergmann (1987) found that applicants interviewed by women were less attracted to the recruiting organization than those interviewed by men, although Harris and Fink (1987) found that recruiter gender was unrelated to reactions to organizations. Thus, although evidence is mixed, applicants may be less attracted to firms when interviewed by woman recruiters.

Research on recruiter age suggests that, within limits, applicants respond more positively to young recruiters. Applicants may respond more positively because they see young recruiters as more similar to themselves than older recruiters. On the other hand, older recruiters may be seen as having more power and status in a firm, creating more positive perceptions of job attractiveness. Rogers and Sincoff (1978) found in a laboratory study that a 30-year-old recruiter produced more favorable impressions than either a 20- or a 50-year-old recruiter. However, because it seems unlikely that companies would send 20-year-old recruiters to college campuses, such results suggest that applicants prefer younger recruiters. Similarly, Taylor and Bergmann (1987) found that recruiter age was negatively related to company attractiveness. Because the subjects in the cited studies were of college age, it is unclear whether they preferred recruiters similar in age to themselves or had a bias against older recruiters. Nonetheless, we expected that age would be negatively related to attraction.

Taylor and Bergmann (1987) also found that recruiter education level was positively related to the probability that applicants would accept a job offer. We expected that applicants would perceive more educated recruiters as having greater status; thus, they perceive the jobs offered by the recruiters as attractive. Finally, evidence is mixed concerning the effects of recruiters' functions in their firms on applicant reactions. Recruiters who represent the personnel function may be more competent in recruiting and interviewing, thus enhancing applicants' opportunities to receive fair and thorough treatment. Conversely, personnel representatives may produce lower applicant attraction because they are seen as having less knowledge of job requirements and less power in hiring decisions. In this vein, Taylor and Bergmann (1987) found that applicants were less attracted to a company when a recruiter was from the personnel department, although Harris and Fink (1987) found no relationship between recruiter function and reactions to firms. Most of the subjects in Taylor and Bergmann's study (83%) were majoring in either business or engineering, whereas the subjects in Harris and Fink's study represented 35 different majors. We collected our data from applicants using a business school placement center, so they were more similar to Taylor and Bergmann's subjects; thus, we expected applicants to have less attraction to firms when recruiters were from personnel departments.

> *Hypothesis 3a: Job applicants will be more attracted to organizations when they are interviewed by male recruiters.*

> *Hypothesis 3b: Job applicants will be more attracted to organizations when they are interviewed by young recruiters.*

> *Hypothesis 3c: Job applicants will be more attracted to organizations when they are interviewed by highly educated recruiters.*

> *Hypothesis 3d: Job applicants will be more attracted to organizations when they are interviewed by recruiters from the organizational divisions in which the available jobs are located.*

Recruiter and Applicant Similarity Effects

In general, people like others who are similar to themselves more than they like those who are dissimilar, in part because similar others provide "consensual validation" of attitudes and beliefs (Byrne, 1971). This liking in turn influences evaluations of others. Evidence indicates that employment interviewers give higher evaluations to applicants they see as similar to themselves (Baskett, 1973; Rand & Wexley, 1975). Analogously, applicants may evaluate organizations more positively when they perceive recruiters as similar to themselves because applicants desire to work with similar others. Some evidence suggests that applicants view jobs more favorably when recruiters are demographically similar to themselves (Rynes & Barber, 1990). We examined the effects of gender similarity and similarity of alma mater on applicants' attraction to firms. We did not examine the influences of age and race similarity because the overwhelming majority of applicants we were studying were in their early 20s and were white.

Although no previous studies have examined similarity of interviewers' and applicants' alma mater, this variable has practical implications because many firms send recruiters to the institutions from which they graduated. We expected applicants to perceive jobs positively when interviewed by graduates of their own alma maters because positive perceptions of recruiters are likely to translate to positive perceptions of firms. Additionally, applicants may also perceive a higher probability of receiving further contacts from interviewing firms when interviewed by graduates of their own institutions because they believe these recruiters will be more supportive and helpful.

> *Hypothesis 4a: Job applicants will be more attracted to organizations when they are interviewed by recruiters of the same gender as themselves.*

> *Hypothesis 4b: Job applicants will be more attracted to organizations when they are interviewed by recruiters*

> *who are graduates of the institution from which the applicants are graduating.*

Interview Focus

Employment interviews can be used both as selection and recruitment devices. The relative importance of recruitment and selection as organizational goals may influence how recruiters conduct interviews (Rynes, 1989). Recruiters may adjust both the content of interviews and their own verbal and nonverbal behaviors to a recruitment or selection focus. Recruiters' behavior may in turn influence applicants' perceptions of both recruiters and expectancy and valence (Rynes, 1989).

No previous study appears to have investigated whether applicants respond differently to recruitment- and selection-oriented interviews. It seems likely, however, that when recruitment is emphasized recruiters will act more positively toward applicants and discuss the job and company more positively in an attempt to attract the applicants to their firms (Rynes, 1989). They will engage in "selling behaviors," such as emphasizing the positive aspects of the job and the organization. Applicants will perceive recruiters more positively, perceive more selling behaviors to be present, and have higher expectancy perceptions because the recruiters are selling their companies. Further, a focus on recruitment may lead to higher valence perceptions because recruiters emphasize the positive aspects of the jobs; however, if applicants perceive recruiters as overly anxious to attract candidates, they may perceive the jobs as less attractive.

In selection interviews, in contrast, recruiters spend less time discussing the jobs they are hiring for and more time discussing the applicants' backgrounds (Rynes, 1989). An emphasis on selection should lead applicants to perceive that the recruiters are interested in them as candidates and may positively influence expectancies of further contacts from the firms. However, an emphasis on selection may also lead to perceptions that the firms are extremely particular about choosing employees, thus lessening expectancy perceptions. Additionally, if applicants perceive firms that are selective in choosing employees as more attractive employers, an interview focus on selection may positively influence valence perceptions.

In summary, we expected interview focus to be related to applicant perceptions of recruiter behaviors and to expectancy and valence perceptions. The finding that few recruiters are trained in interviewing (Rynes & Boudreau, 1986), however, suggests that recruiters may lack the skills needed to alter their behaviors with an interview's focus; nonetheless, we expected a recruitment focus to lead applicants to perceive recruiters more positively and to perceive more selling behaviors and a selection focus to influence applicants' perceptions that the recruiters are interested in them as candidates. Although we expected interview focus to influence expectancy and valence perceptions, on the basis of the logic discussed above, we did not make any directional hypotheses about this relationship.

Hypothesis 5a: Interviews more focused on recruitment than on selection will lead job applicants to perceive recruiters more positively.

Hypothesis 5b: Interviews more focused on recruitment than on selection will lead job applicants to perceive the presence of a high number of recruiter selling behaviors.

Hypothesis 5c: Interviews more focused on selection than on recruitment will lead applicants to perceive that the recruiters are interested in them as candidates.

Interview Structure

Researchers have begun to stress the importance of using a structured approach, or following a definite pattern of questions when obtaining information from job candidates (Janz, 1989; Latham, 1989). Meta-analyses have indicated that structured interviews are more valid predictors of job success than unstructured interviews (Weisner & Cronshaw, 1988). Further, more firms are actually using structured approaches for interviewing job candidates (Solomon, 1989). Little is known, however, about how structured interviews influence applicants' perceptions of recruiters and firms. Applicants who, for example, view structured interviews as formal, evaluative, rigid, and even negative, may have low attraction to firms using such interviews. If applicants react negatively to structured interviews and withdraw from the selection process, the loss of top-quality candidates may offset the increased utility (from the higher validity) of structured interviews. On the other hand, applicants may react positively to structured interviews if they feel that they were given the opportunity to thoroughly describe their qualifications. Because applicants who feel they adequately described their qualifications may have greater expectancies of receiving further contacts from firms, interview structure may positively influence attraction to firms.

Taylor and Bergmann (1987) found that recruiters' reports of interview structure were positively related to probability of job offer acceptance; however, these results should be replicated because they measured interview structure with a single item. Herriot and Rothwell (1981) found that applicants were less likely to accept job offers when there were discrepancies between their expectations and actual interviewer behaviors for several aspects of interviews. These aspects included how much opportunity for discussion there was, how much interviewers talked, how much information they provided about their firms, and how much they asked about applicants. It seems likely that attempts to structure interviews may influence such factors. Similarly, Macan and Dipboye (1990) found that the more interviewers talked about irrelevant subjects, the less favorably applicants rated them. We expect that recruiters who use a structured approach probably spend less time on irrelevant topics and more time discussing jobs and applicants' qualifications. We expected such behaviors to positively influence applicants' perceptions that recruiters are interested in them and also their valence and expectancy perceptions.

> *Hypothesis 6a: Highly structured interviews will lead job applicants to perceive that recruiters are interested in them as candidates.*
>
> *Hypothesis 6b: Highly structured interviews will lead job applicants to perceive the presence of a high number of recruiter selling behaviors.*
>
> *Hypothesis 6c: Highly structured interviews will lead applicants to have high valence and expectancy perceptions.*

In summary, our research investigated influences on applicants' attraction to interviewing firms. In part, this study replicated earlier research by investigating the influences of applicant perceptions of recruiters' behaviors and demographic characteristics on attraction. However, we also included measures of recruiter behaviors and characteristics not investigated by prior research. Further, we extended earlier research by investigating the relationship between recruiters' reports of interview focus and structure and applicants' perceptions of recruiter behaviors and their attraction to firms.

METHODS

Procedures

Data were collected from applicants and recruiters under the auspices of the placement center of the college of business at a large midwestern university. A research assistant solicited participation from applicants who were interviewing at the placement center. Before their first interviews, we asked applicants to complete a background survey, which included the measures of self-esteem and demographics. After each interview, each applicant completed a survey measuring perceptions of the recruiter's behaviors and demographic characteristics and the applicant's attraction to the particular firm. Each morning, the placement office provided recruiters with packets of information that included their interview schedules and information about applicants; we added a letter asking the recruiters to participate in this study and a survey form for each interview scheduled. The letter promised the recruiters a brief summary of research results and asked them to complete a survey after each interview and to deposit the surveys in a specified box at the end of the day. Recruiter surveys measured interview focus and structure.

During the data collection period, 145 recruiters representing 94 companies conducted approximately 1,600 interviews at the placement center. Seventy-four recruiters (51%) completed 694 surveys, representing 43 percent of the interviews. It is difficult to estimate how many applicants participated in the 1,600 interviews. Although 447 students were registered with the placement office, recruiters generally selected applicants to interview from this pool of applicants, so some students may not have interviewed during the data collection period. However, 272 applicants completed 644 surveys after campus interviews, representing 40 percent of the interviews. Research assistants were not able to solicit participation from every applicant after every interview because some applicants used an exit approximately 75 feet from where the research assistants were stationed. Therefore, the response rates reported above do not mean that applicants actually declined to complete surveys 60 percent of the time.

Because we were interested in recruiter-applicant interactions, the unit of analysis for this study was the campus interview. Therefore, we conducted the analyses using only data on interviews after which both applicant and recruiter completed surveys ($N = 293$). The data from these 293 interviews were collected from 182 applicants and 70 recruiters representing 50 firms. The number of interviews per applicant varied from one to nine, with almost two-thirds of the applicants (120) participating in only one interview. The number of interviews per recruiter varied from 1 to 19, with almost two-thirds of the recruiters (46) participating in four or fewer interviews. We conducted *t*-tests to investigate whether the responses of the subgroup of applicants and recruiters who were included in the 293 interviews differed from the responses of applicants and recruiters who were not included in the study. These tests used study inclusion as the independent variable; measures of recruiters' behavior, interview focus and structure, applicants' self-esteem, number of prior interviews, and expectancy and valence perceptions were the dependent variables. In general, responses of applicants and recruiters in the study were very similar to responses of applicant and recruiters not included in the study; out of 14 tests, the results of one were significant, and the study inclusion variable accounted for less than 1 percent of the variance in the focal dependent measure. Such results suggest that the responses from the applicants and recruiters in the 293 interviews we analyzed were representative of the applicants and recruiters who used the placement center during our data collection period.

Respondents

Most of the applicants were either finance (24%), marketing (23%), or management (18%) majors who were completing their bachelor's degrees (95%). The applicants were predominantly white (96%), with even numbers of men (50%) and women (50%). Their average age was 22 years. The recruiters were predominantly white (99%) men (73%).

Measures of Independent Variables

Applicant perceptions of recruiter behaviors. Applicants indicated their agreement (on five-point scales) with 22 statements describing interviewer behaviors. We adapted some of these items from earlier research (Harris & Fink, 1987; Liden & Parsons, 1986; Powell, 1984) but developed items dealing with recruiters' interview structuring and selling behaviors specifically for this study. We conducted a principal components analysis with varimax rotation using all surveys completed after campus interviews. The scree test and eigenvalues-greater-than-1.0 criteria suggested five factors that accounted for 51 percent of the variance of the items. We assigned items to the factors on which they had the highest loadings, dropping items 6 and 7 because they had high and almost equal loadings on two factors. We unit-weighted the items assigned to factors to create these scales: recruiter interest in candidate, informativeness, interview structuring, intimidation, and selling behaviors.

To determine the internal consistencies of the scales, we computed coefficient alphas, using the 293 applicant surveys for which recruiters also completed surveys. Items were dropped to increase a scale's internal consistency when warranted. Items 12 and 14 reduced the internal consistency of the scale measuring interview structuring. In addition, these items assessed recruiters' use of difficult and specific questions, which is conceptually distinct from interview structuring. Thus, we did not use these items in scale construction. In addition, because the coefficient alpha for the two-item scale that included items 16 and 19 was unacceptably low, and item 16 appeared to be the best measure of recruiter selling behaviors, we used only item 16 to measure selling behaviors. Although we realize the limitations associated with one-item scales, because the investigation of the selling behaviors scale was somewhat exploratory, we decided to retain it for analyses. Table 1 presents the original items, the factor loadings of the items assigned to scales, the scales, and their coefficient alphas.

Recruiters' demographic characteristics. We measured applicant perceptions of recruiters' demographic characteristics rather than asking recruiters directly because, as have prior researchers, we assumed that it is perceptions that are influential. For example, it is not a recruiter's age per se that influences attraction, but an applicant's perceptions of the recruiter's age. Applicants were asked to identify their recruiters' genders and to say whether they worked in the personnel divisions of their companies or in the divisions in which the jobs interviewed for were located. In addition, applicants were asked to estimate recruiters' ages and the highest educational degree they had attained (high school diploma or bachelor's, master's, or Ph.D. degree).

Recruiters' similarity to applicants. Applicants indicated whether they thought recruiters were graduates of the applicants' university. Because we were interested in whether similarity perceptions influenced applicant attraction, we created a dichotomous variable, labeled "alumnus-alumna" (1 = yes, 0 = no or don't know). Additionally, we created a variable measuring gender similarity, coding an interview with 1 when applicant and recruiter were of the same gender and with 0 when they were of different genders.

Interview focus: Recruiter perceptions. Recruiters indicated their agreement with four items measuring interview focus. Two items ($\alpha = .85$), "The major focus of this interview was to evaluate the applicant" and "This in-

TABLE 1
Applicant Perceptions of Recruiter Behaviors: Items and Factor Loadings[a]

Items	Interest in Candidate: Factor 1	Informativeness: Factor 2	Interview Structuring: Factor 3	Intimidation: Factor 4	Selling Behaviors: Factor 5
13. Allowed me to describe my qualifications	**.71**	−.07	.06	−.07	−.18
9. Seemed interested in the contribution I could make	**.67**	−.21	−.01	−.05	.07
2. Was sensitive to my concerns	**.62**	−.34	−.10	−.06	.22
1. Was a likable person	**.58**	−.35	−.09	−.11	.14
7. Conducted an excellent interview	.57	−.52	.00	−.08	.05
17. Asked me about my work preferences	**.53**	.06	.01	−.11	.15
10. Was familiar with my background	**.35**	−.22	−.06	−.04	.25
11. Was unable to answer my questions	−.02	**.69**	.13	.15	−.03
8. Was not prepared for the interview	−.21	**.68**	−.15	.09	.02
22. Set aside time for me to ask questions	.27	**−.55**	−.05	.10	−.01
18. Did not spend enough time discussing issues that were important to me	−.41	**.51**	.16	.11	−.05
21. Gave me a good introduction to the interview	.19	**−.47**	.21	−.12	.37
6. Asked inappropriate questions	−.07	.39	.12	.38	.07
20. Followed a definite pattern of questions	−.04	−.11	**.84**	.06	.06
15. Acted like he/she was following a script	−.22	.16	**.76**	.13	.00
14. Asked specific questions	.43	−.19	.52	−.09	−.14
12. Asked difficult questions	.05	.23	.50	.19	−.12
4. Was confrontational	−.04	−.00	.10	**.80**	.04
3. Made me feel uncomfortable	−.16	.04	.01	**.73**	−.01
5. Tried to intimidate me in the interview	−.13	.39	.20	**.59**	−.07
16. Attempted to sell me on the company	.17	.11	−.07	−.07	**.78**
19. Described the careers of others	.02	−.10	−.04	.12	.74
Eigenvalue	3.04	2.80	2.01	1.87	1.54
Percentage of variance accounted for	13.8	12.7	9.1	8.5	7.0
Coefficient alpha[b]	.72	.64	.68	.67	

[a] $N = 552$ because of listwise deletion of respondents for whom data were missing. Boldface indicates items used in scale construction.

[b] We calculated coefficient alpha using the data from the 293 interviews after which both applicants and recruiters completed surveys.

terview was used primarily to determine the applicant's qualifications," measured the extent to which an interview was focused on examining applicant qualifications. Two items ($\alpha = .84$), "The purpose of this interview was to market the company" and "My major focus of this interview was selling the company," measured the extent to which an interview was focused on marketing the firm. Recruiters also indicated the percentages of time they spent on selling the jobs and firms, on discussing and evaluating applicant qualifications, and on other topics (total of 100 percent). Because time spent on other topics was information that was totally dependent upon the time spent selling the job and discussing the applicant, we did not use it in subsequent analyses.

Interview structure: Recruiter perceptions. Three items ($\alpha = .70$) measured the extent to which a recruiter followed a structured format, used a rating scale for candidate responses, and asked a candidate the same questions as other candidates.

Moderator variables. We measured applicants' global self-esteem on the background survey using nine items adapted from Rosenberg (1965). The post-interview survey asked applicants to record the number of prior campus interviews they had attended.

Dependent Measures: Applicant Attraction to an Interviewing Organization

We measured applicant attraction to firms as expectancy and valence perceptions. Prior researchers have measured applicant attraction as intentions to accept a job offer, job attractiveness, and expectancy and valence perceptions without explicitly differentiating these measures of attraction. We measured expectancy and valence perceptions because they influence motivation to continue to seek employment with firms, which in turn influences opportunities to receive and accept job offers (Rynes, 1989). Further, different aspects of campus interviews may have varying associations with these indicators of attraction to firms. For example, variables affecting the perceived status of jobs may influence valence, but not expectancy, perceptions.

Expectancy perceptions. Applicants indicated how likely it was (1, very unlikely, to 5, very likely) that "this company will invite you for a second interview" and "will make you a job offer" ($\alpha = .87$).

Valence perceptions. Applicants indicated their "regard for the company" (1, low regard, to 5, high regard) and the "attractiveness of the job" (1, very unattractive, to 5, very attractive) ($\alpha = .81$).

Analyses

Although each interview was a unique interaction between a recruiter and an applicant, there were multiple responses from both applicants and recruiters. Thus, a question arises concerning the independence of the 293 interviews. To obtain some evidence concerning that independence, we investigated whether recruiters reported acting consistently across interviews and whether different applicants perceived the same recruiter similarly. We calculated correlations between the recruiters' reports of interview focus and structure across interviews to obtain insight into the intrarater reliability of recruiters across interviews. For these analyses, we considered a recruiter the unit of observation and calculated correlations between each measure across interviews. For example, recruiters' reported interview structure for interview 1 was correlated with structure for interview 2, interview 3, and so forth. Because at least three recruiters conducted nine interviews, there were 36 correlations [9(9-1)/2]. We then weighted each correlation by the number of observations it included ($n = 63$ for interview 1 with 2, $n = 47$ for interview 1 with 3, $n = 35$ for interview 1 with 3, $n = 3$ for interview 1 with 9, etc.) and divided by the total number of observations. In general, results indicated that recruiters were relatively consistent across interviews. The weighted mean correlations were .84 for time spent discussing the job, .85 for time spent discussing the applicants' qualifications, .88 for the marketing the company scale, .87 for the applicant qualifications scale, and .92 for the interview structure scale.

To measure the extent to which applicants described recruiters similarly, we calculated weighted mean correlations across interviews for the scales measuring applicant perceptions of recruiter behaviors. These analyses provide evidence concerning the interrater reliability of applicants within recruiters. Again, these analyses were based on 36 correlations. The weighted mean correlations were .24 for interest in candidate, .17 for recruiter informativeness, .19 for interview structuring, .11 for recruiter intimidation, and .17 for recruiter selling behaviors. In summary, although recruiters reported a similar focus and structure for all their interviews, different applicants perceived the same recruiters differently. Such results provide some support for the belief that, at least from the applicant's viewpoint, each interview is a unique interaction between an applicant and a recruiter.

We conducted regression analyses to test Hypotheses 1; 3a, 3b, 3c, and 3d; 4a and 4b; 5a, 5b, and 5c; and 6a, 6b, and 6c; all of these contain predictions related to applicant attraction to firms. To determine which variables explained unique variance in applicant attraction, we conducted a regression analysis with all the predictors in the equation; the significance test for a regression coefficient indicates the unique variance the independent variable explains in the dependent variable (Pedhazur, 1982). To determine the unique contribution of each set of variables, we conducted a usefulness analysis (Darlington, 1968), calculating R^2 for the full model and then for a reduced model that did not contain the set of variables of interest. The difference in variance accounted for between the full and the reduced models is the unique variance (usefulness) the removed set of variables accounts for; the order of the variables' entry does not affect the calculation of unique variance (Pedhazur, 1982).

Because results indicated that recruiters' reported interview focus and structure were relatively consistent across interviews, we reconducted the regression analyses, including dummy-coded vectors identifying recruiters to control for variance in the dependent measures resulting from individuals. For expectancy perceptions, the dummy-coded vectors did not add any significant explanatory variance over the full model ($\Delta R^2 = .28$, $F_{60,102} = 1.01$, $p \geq .05$). For valence perceptions, however, their addition did add explanatory variance over the full model ($\Delta R^2 = .32$, $F_{60,102} = 1.47$, $p < .05$). However, the patterns of relationships between the predictors and the dependent variables were similar with and without the dummy-coded vectors in the equation. Therefore, we present results from the analyses that did not include the additional vectors.

Hierarchical moderated regression analyses were used to determine if self-esteem and number of prior interviews moderated the relationship between applicant perceptions of recruiter behaviors and expectancy and valence perceptions. The first step in this analysis involved entering the five scales measuring perceptions of recruiter behaviors and the proposed moderators. In the second step, we added the cross-products of the five scales and the moderators. The moderating effect was tested by determining whether the cross-products explained any additional variance in the dependent variable.

We tested for an applicant-recruiter gender similarity effect by using multivariate analysis of variance with applicant and recruiter genders and their interaction as the independent variables and expectancy and valence perceptions as the dependent variables. A significant interaction would indicate a similarity effect and be followed with univariate analyses and analysis of simple main effects. In addition, we included the gender similarity variable in the overall regression analyses.

Finally, we used canonical correlation analyses to test for possible relationships between the recruiters' reports of interview focus and the applicants' perceptions of recruiter behaviors. Simple zero-order correlations provided information about relationships between recruiters' reports of interview structure and applicants' perceptions of recruiter behaviors.

RESULTS

Table 2 presents the means, standard deviations, coefficient alphas, and zero-order correlations among the variables. The recruiter behavior scales were moderately intercorrelated; the absolute values of the correlations ranged from .03 to .58. Time spent discussing the applicants was positively correlated with the applicant qualifications scale, and time spent discussing the jobs was positively correlated with the marketing-the-company scale. Both indicators of selection focus were negatively correlated with the indicators of recruitment focus. Such results suggest that the measures of interview focus have some convergent and discriminant validity. Finally, expectancy and valence perceptions were moderately correlated ($r = .35$).

TABLE 2
Correlations, Means, and Standard Deviations of All Variables[a]

Variables	Means	s.d.	1	2	3	4	5	6	7	8
Applicant perceptions of recruiter behaviors										
1. Interest in candidate	3.8	0.55	(72)							
2. Informativeness	4.0	0.55	.58*	(64)						
3. Interview structuring	2.6	0.94	−.13*	−.12	(68)					
4. Intimidation	2.0	0.78	−.25*	−.30*	.26*	(67)				
5. Selling behaviors	3.1	1.08	.15*	.03	−.05	−.04				
Recruiter demographic characteristics										
6. Gender	1.7	0.44	−.00	.07	−.16*	−.11	.01			
7. Age	34.4	7.83	−.05	−.01	−.13*	−.05	−.03	.35*		
8. Organizational division	1.3	0.45	.09	.05	.16*	.12	.10	−.23*	−.15*	
9. Education	2.2	0.43	.16*	.22*	.11	−.09	.02	.03	.15*	−.07
Recruiter similarity to applicant										
10. Alumnus-alumna	0.1	0.31	.08	−.01	−.14*	−.03	.06	−.08	−.16*	−.15*
11. Gender similarity	0.5	0.50	.09	.13*	−.10	−.11	−.02	−.01	.01	−.04
Interview focus: Recruiter perceptions										
Selection focus										
12. Applicant qualifications	4.1	0.73	.07	.01	.29*	.14*	−.11	−.21*	−.27*	.29*
13. Time spent, applicant	60.8	22.13	.13*	.02	.29*	.10	−.19*	−.05	.01	.13*
Recruitment focus										
14. Marketing company	2.5	0.86	.04	.12	−.06	−.09	.16*	−.00	−.16*	.19*
15. Time spent, job	28.0	20.82	−.16*	−.03	−.22*	−.09	.18*	−.04	−.01	−.07
Interview structure: Recruiter perceptions										
16. Interview structure	2.8	0.88	.08	.14*	.27*	−.04	.12	.02	−.11	.20*
Moderating applicant characteristics										
17. Gender	1.5	0.50	.01	.02	.02	−.18*	.00	−.02	.04	−.01
18. Self-esteem	4.0	0.42	.23*	.21*	−.21*	−.07	.11	−.04	.01	.14*
19. Number of prior interviews	5.3	4.77	−.14*	−.17*	−.09	.04	.08	.05	.05	.04
Dependent variables										
20. Expectancy of job offer	3.2	0.89	.39*	.25*	−.06	−.23*	.16*	.03	−.09	.07
21. Valence of job	3.9	0.86	.49*	.35*	−.14*	−.12*	.08	.11	.06	.00

[a] Numbers in parentheses on the diagonal are coefficient alphas for scales.

* $p < .05$

TABLE 2 (continued)

9	10	11	12	13	14	15	16	17	18	19	20	21
−.01												
−.00	.11											
.04	.05	−.01	(85)									
.05	.00	.01	.43*									
.01	.00	.05	−.12*	−.35*	(84)							
−.04	−.09	.03	−.39*	−.89*	.43*							
.05	−.17*	−.04	.18*	.13*	.37*	.01	(70)					
.09	−.04	.48*	.03	.08	.07	−.01	.10					
.03	.06	.08	.03	−.01	.04	−.01	−.06	.06	(77)			
−.13*	.01	.10	.01	.07	−.08	−.03	−.10	.10	.06			
−.02	−.05	.00	.05	−.06	.06	.03	.15*	−.01	.17*	−.03	(81)	
.18*	.13*	.17*	.10	.09	−.01	−.17*	−.03	−.02	.14*	−.03	.35*	(85)

Hypothesis 1

In support of Hypothesis 1, results from the regression analyses indicate that applicant perceptions of recruiter behaviors explain attraction to firms (see Table 3). The set of measures of applicant perceptions of recruiter behaviors uniquely explained 19 percent of the variance in expectancy perceptions and 17 percent of the variance in valence perceptions. Further, recruiter interest in candidates was positively related to both indicators of attraction to an organization, and recruiter intimidation was negatively related to expectancy perceptions. Finally, recruiters' selling behavior was positively related to expectancy perceptions, and their informativeness was positively related to valence perceptions, with both relationships at the $p < .10$ level.

Hypotheses 2a and 2b

Results from the moderated regression analyses failed to support the hypothesized moderating effects of applicants' self-esteem and the number of prior interviews they had taken. None of the individual cross-product terms was significant, and the set of cross-product terms did not account for additional variance in either expectancy or valence perceptions.

Hypotheses 3a, 3b, 3c, and 3d

Results from the regression analyses indicated that the set of recruiters' demographic characteristics did not explain unique variance in either expectancy or valence perceptions. None of the demographic characteristics was related to valence perceptions. Although recruiter education was negatively related to expectancy perceptions ($p < .10$), the direction of the relationship was opposite to our expectations. Such results fail to support Hypothesis 3c and suggest that recruiter demographic characteristics are relatively unimportant to applicant attraction to firms, although applicants perceived less likelihood of their receiving further contacts from a firm when they perceived recruiters to be highly educated.

Hypotheses 4a and 4b

Our analyses provided some support for a gender similarity effect. Neither applicant nor recruiter gender had a significant, multivariate main effect on attraction, but there was a significant, multivariate interaction effect ($F_{2,229} = 5.96$, $p < .01$). Follow-up univariate analyses indicated a significant interaction for valence perceptions ($F_{1,230} = 10.64$, $p < .01$). Analysis of simple main effects (see Figure 1) indicated that male applicants had higher valence perceptions when interviewed by men ($\bar{x} = 4.02$ vs. 3.44, $p < .01$), supporting the similarity hypothesis. Recruiter gender did not, however, influence female applicants' valence perceptions. Similarly, the regression coefficient for gender similarity was positively related to valence perceptions at the $p < .10$ level, suggesting that gender similarity explains unique variance in valence perceptions.

TABLE 3
Results of Hierarchical Regression Analyses Predicting Applicant Attraction[a]

Predictors	Expectancy Perceptions		Valence Perceptions	
	β	Unique R^2	β	Unique R^2
Recruiter behavior				
Interest in candidate	.27**		.31***	
Informativeness	.13		.16†	
Interview structuring	.08		−.04	
Intimidation	−.19*		.03	
Selling behaviors	.12†	.19***	.11	.17***
Recruiter demographic characteristics				
Gender	.02		.02	
Age	−.10		.09	
Organizational division	.01		−.06	
Education	−.15†	.03	.07	.02
Recruiter similarity to applicant				
Alumnus-alumna	−.13†		.08	
Gender similarity	−.03	.02	.14†	.02†
Interview focus: Recruiter perceptions[b]				
Applicant qualifications	−.04		.11	
Marketing company	.05		.05	
Time spent, job	.04	.01	−.18*	.04*
Interview structure: Recruiter perceptions	.08	.00	−.09	.01
Applicant gender[c]	.02		−.04	
R^2	.26***		.32***	
Adjusted R^2	.18		.25	
N	179		179	

[a] Regression coefficients for the full model are shown. Unique R^2 refers to the unique variance accounted for by a set of variables.

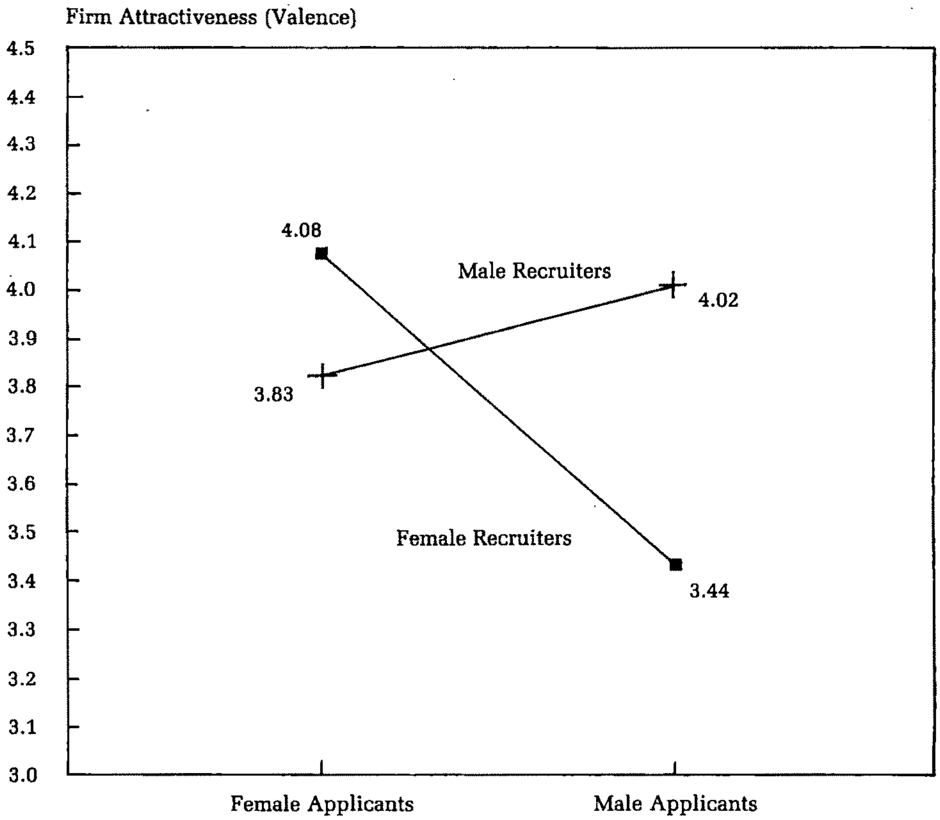
[b] Because of the strong correlation between time spent selling the jobs and time spent examining applicant qualifications (−.89) and subsequent concerns about multicollinearity, we included only time spent selling the jobs in the regression analyses.

[c] Applicant gender was included in the regression equation only because it was a component of gender similarity; therefore, we did not calculate its unique R^2.

† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

The results did not support the hypothesis that applicants will be more attracted to firms when interviewed by alumni of their own university. In the regression analyses, alma mater similarity was unrelated to valence perceptions and negatively related to expectancy perceptions ($p < .10$). Such results suggest that, contrary to expectations, applicants had lower percep-

FIGURE 1
Applicant-Recruiter Gender Similarity and Firm Attractiveness



tions of receiving further contacts from a firm when recruiters were alumni of their university.

Hypotheses 5a, 5b, and 5c

A canonical correlation analysis supported the hypothesized relationship between the four measures of recruiters' reports of interview focus and the five measures of applicant perceptions of recruiter behaviors. The first canonical correlation was .43, (approximate $F_{20,833} = 3.77$, $p < .001$), and the second canonical correlation was .22 (approximate $F_{12,675} = 1.68$, $p < .07$). For completeness, we present results from the second canonical variate, although it was not significant at the .05 alpha level, realizing that such results should be cautiously interpreted. Table 4 presents the canonical loadings (the variate-variable correlations), the percentage of explained variance in the variables accounted for by the variate, and the redundancy coefficients (the amount of variance in one set of variables accounted for by the other canonical variate).

TABLE 4
Results of Canonical Analysis

Variables	First Canonical Variate Loadings	Second Canonical Variate Loadings
Applicant perceptions of recruiter behavior		
Interest in candidate	.20	.25
Informativeness	.00	.63
Interview structuring	.79	.33
Intimidation	.35	−.21
Selling behaviors	−.44	.60
Percentage of variance explained	.20	.20
Redundancy	.04	.01
Interview focus: Recruiter perceptions		
Selection focus		
Applicant qualifications	.79	.25
Time spent, applicant	.89	−.10
Recruitment focus		
Marketing company	−.32	.93
Time spent, job	−.79	.27
Percentage of variance explained	.53	.25
Redundancy	.10	.01
Canonical correlations	.43	.22

Using the typical cutoff of .3 to interpret the canonical loadings, we found that the results from the first canonical variate suggest that when recruiters reported focusing more on selection and less on recruitment, applicants perceived interviews as having high structure and containing few selling behaviors and saw recruiters as intimidating. Results from the second canonical variate indicate that when recruiters focused more on marketing their companies, applicants saw them as informative and as engaging in many selling behaviors and also saw the interviews as structured. Such evidence provides some support for the hypothesized relationships between recruiters' reported interview focus and applicants' perceptions of recruiter behaviors.

The results provide some support for the hypothesized relationships between recruiters' interview focus and applicant attraction. Although none of the measures of interview focus were related to expectancy perceptions, the set of measures of interview focus uniquely explained 4 percent of the variance in valence perceptions. Specifically, time spent discussing the jobs was negatively related to valence perceptions. Such results indicate that applicants saw jobs as less attractive when recruiters spent more time discussing them.

Hypotheses 6a, 6b, and 6c

Results provided some support for Hypotheses 6a, 6b, and 6c, which state that interview structure will be positively related to applicant perceptions of recruiter behaviors and to attraction to firms. Although recruiters' reports of interview structure were positively correlated with applicants' perceptions of interview structuring and selling behaviors, they were unrelated to the other measures of recruiter behaviors. Further, in the regression analyses, interview structure was not related to attraction to firms. Such results suggest that when recruiters reported structuring interviews, applicants perceived the interviews as structured and as containing many selling behaviors but did not have more positive perceptions of recruiters and were not more attracted to the firms than they would have been otherwise.

DISCUSSION

Our findings confirm the important role that recruiters play in maintaining applicants' attraction during the initial stage of recruitment. Results confirmed that applicant perceptions of recruiter behaviors were related to attraction. In general, recruiters' demographic characteristics were unrelated to applicants' attraction to firms. Additionally, some evidence suggested that applicants' attraction to organizations was related to similarity between recruiters and applicants. Finally, recruiters' reports of interview focus were related to applicant perceptions of recruiter behaviors and to valence perceptions.

The set of measures of applicant perceptions of recruiter behaviors explained unique variance in both expectancy and valence perceptions. Specifically, applicant perceptions of recruiters' interest in candidates explained unique variance in both indicators of attraction. Such findings are similar to results of Alderfer and McCord (1970), who also found that interviewer interest in candidates and in the candidates' contributions had the strongest link to applicants' attraction to firms. Additionally, applicants had stronger expectancy perceptions when they saw recruiters as less intimidating and as exhibiting more selling behaviors. Finally, recruiter informativeness was positively related to valence perceptions. Our results suggest that applicant perceptions of recruiter behaviors are the strongest predictors of attraction to firms and underscore the importance of recruiters' showing interest in candidates. The finding that applicants' perceptions of recruiter interest in them as candidates was such a strong predictor of both expectancy and valence perceptions emphasizes the need to know more about what causes applicants to perceive that recruiters are interested in them. For example, future research should investigate the specific nonverbal and verbal behaviors leading applicants to believe that recruiters are interested in them. Additionally, research should investigate whether recruiters can be trained to show more interest in candidates or whether recruiters with certain personality characteristics (e.g., empathy, extroversion, etc.) are perceived as showing a great deal of interest in candidates. Finally, extrapolating from our results, it seems likely that the interest shown in a candidate at later stages in the recruitment process also influences expectancy and valence perceptions and ultimate job offer decisions.

In general, recruiters' demographic characteristics were unrelated to attraction, although education was marginally, negatively related to expectancy perceptions. We asked applicants to indicate the recruiters' education levels, assuming that recruiters provided information about themselves. However, if recruiters did not disclose their education levels, applicants may have left the question unanswered (there were 24 missing responses) or guessed the educational level of the recruiters. If applicants guessed the recruiters' education level, they may have based their guesses on their perceptions of the recruiters' status. Thus, the negative relationship between recruiter education level and expectancy perceptions may have occurred because applicants perceived higher-status recruiters as more educated and therefore perceived less likelihood of receiving further contacts from the firms. Future research should investigate how recruiter education level influences applicant attraction.

The hypothesis that applicants would be more attracted to firms when recruiters were similar to themselves received some support. Men had higher valence perceptions when interviewed by men, supporting the similarity hypothesis, although women had similar valence perceptions for man and woman recruiters. Such results conflict with Taylor and Bergmann's (1987) finding that female applicants were more likely to accept an offer when they had been interviewed by men, although male applicants were not influenced by recruiter gender. An alternative interpretation of our finding is that male applicants might have perceived recruiters who were women as having lower organizational status, making the jobs under discussion less attractive. Future studies should determine whether job applicants are more attracted to firms when recruiters are demographically similar to themselves or when the recruiters have greater status in the interviewing organization. Finally, contrary to our predictions, expectancy perceptions were lower when applicants were interviewed by recruiters who were graduates of the same school as the applicants. Future research should continue to investigate the influences of recruiter-applicant similarity on attraction to firms. Additionally, research should differentiate between perceived and actual similarity (Turban & Jones, 1988). This study investigated the influences of actual similarity of gender and alumnus status. Future research might investigate whether applicants' perceived similarity in work values and attitudes to either recruiters or the employees of a firm influences attraction to the firm.

A notable contribution of this study is our extension of earlier research by investigating the effects of recruiters' reports of interview focus on applicants' perceptions of the recruiters and on attraction to a firm. Recruiters' reported focus on recruitment was related to applicants' perceiving recruiters as highly informative, as exhibiting many selling behaviors, and as conducting structured interviews. Recruiters' focus on selection was related to applicants' perceptions that interviews were structured, involved few selling behaviors, and involved much recruiter intimidation. Perhaps recruiters who emphasized selection asked questions that were difficult for applicants to answer, leading to perceptions that the recruiter was intimidating. In summary, recruiters' interview focus influenced applicants' perceptions of recruiter behaviors in such a way that applicants perceived recruiters more positively when they focused more on recruitment.

When recruiters reported spending more time discussing a job and company, presumably to market the firm, applicants had lower valence perceptions than they had when such discussion was less prominent. These results suggest that a focus on marketing a firm may not have the intended results. When recruiters spent much time discussing a job, applicants felt there was something wrong with it, perhaps because of the negative stereotype applicants have of recruiters (Fisher, Ilgen, & Hoyer, 1979). Conversely, recruiters who spent much time discussing jobs may have been recruiting for less attractive positions and therefore spent more time trying to sell them. Nonetheless, applicants may have perceived the jobs as unattractive and so rated them.

Interview focus was measured in terms of the percentages of time spent selling a company and evaluating an applicant and with scales assessing the purpose and focus of an interview. The correlations among these different measures of interview focus suggest that these measures had some convergent and discriminant validity. Nonetheless, the pattern of correlations also suggests that the measures of time spent and interview focus have partially distinct meanings. Additionally, time spent discussing the jobs, presumably a marketing tool, was negatively related to valence perceptions, but the marketing-the-company scale was not related to valence perceptions. Therefore, although our results suggest that interview focus influences applicant perceptions of recruiter behaviors and the attractiveness of a job, further research is needed to replicate this finding. In addition, evidence is needed concerning the relative values of the different measures of interview focus.

Recruiters' reports of interview structure were positively related to applicant perceptions of interview structure and of selling behaviors. Such results suggest that applicants may have perceived high levels of interview structure and selling behaviors because recruiters included a specific section of the interview selling their firms to candidates. However, interview structure was not related to either expectancy or valence perceptions.

Certain limitations of this study must be acknowledged. First, as with many studies investigating recruitment processes, the respondents were students who were interviewing through a college placement center. Researchers have not studied whether results from campus interviews generalize to other populations of applicants. Second, same-source method variance may influence the relationships among the measures collected from applicants because we collected applicants' responses using one instrument completed after campus interviews. However, same-source method variance did not influence the relationships between recruiters' reports of interview structure and focus and applicant perceptions of recruiter behaviors and attraction to a firm. Further, such method variance would not influence the finding that certain recruiter behaviors explained unique variance in the measures of attraction because it presumably would equally affect the relationships among all variables. Nonetheless, applicants may have been primed by initial impressions of firms to respond to questions in a consistent manner. For example, although it appears that applicant perceptions of recruiter behaviors influence attraction, applicants may have initial impressions of a firm that in turn influence perceptions of recruiter behaviors and attraction. The design of this study precludes a definite statement of the causal relationships between recruiter behaviors and attraction to firms. Additionally, we were unable to measure actual job choice. However, we measured expectancy and valence perceptions, which others have found to influence job choice (Rynes, 1989; Schwab, Rynes, & Aldag, 1987). Finally, the one-item scale measuring recruiter selling behavior has unknown psychometric properties. Given the positive findings from this study, researchers should attempt to develop more psychometrically valid measures of recruiter selling behaviors.

In summary, we extended earlier research by collecting data from both applicants and recruiters following actual campus interviews and by investigating the effects of variables that have received little attention in recruitment research. In general, the recruitment process involves some variation of the following stages: a decision to interview with a firm, an initial interview, a follow-up interview, site visit, or both, and a job offer decision. We investigated how the campus interview, one of the first stages in the recruitment process, influences applicant attraction to firms. It is important to study the initial interview because such interviews influence applicants' decisions to continue to pursue employment with a firm. However, research is also needed to study the other stages in the recruitment process. For example, little is known about what influences applicants' decisions to interview with firms. Similarly, researchers should investigate how site visits influence job choices. We expect that at later stages in the recruitment process, campus recruiters become less important because applicants obtain information about job characteristics and potential co-workers. As organizations continue to face shortages of qualified workers (Jackson & Schuler, 1990) and as fewer young people enter the labor market (Offermann & Gowing, 1990), research into how the recruitment process influences applicant attraction can be valuable. Researchers should investigate all stages of the recruitment process and begin to develop models delineating how its various stages influence attraction to firms and ultimate job choice decisions.

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INSTITUTIONAL AND STRATEGIC CHOICE PERSPECTIVES ON BOARD INVOLVEMENT IN THE STRATEGIC DECISION PROCESS

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The level of a board of directors' involvement in strategic decisions can be viewed as an institutional response or as a strategic adaptation to external pressures for greater board involvement. We examined the antecedents and effects of board involvement from both the institutional and strategic choice perspectives. Data obtained from personal interviews with 114 board members and archival records indicated that board size and levels of diversification and insider representation were negatively related to board involvement, and organizational age was positively related to it. Furthermore, we found board involvement to be positively related to financial performance after controlling for industry and size effects. Overall, the results suggest that both theoretical perspectives are necessary for a comprehensive description of the strategic role of boards.

In recent years, external pressure for greater corporate accountability has intensified. Proxy fights are spreading (Dobrzynski, 1988), and shareholder suits against corporate officers and directors are increasing at a 10 percent annual rate (Glaberson & Powell, 1985). As Nussbaum and Dobrzynski argued, "The tight hold professional managers have on the corporation is slipping. Investors are no longer passive. Outside directors are asserting themselves. Other stakeholders—from employees to communities—want a voice. The internal power is beginning to shift" (1987: 102–103).

Increasingly, the pressure for greater accountability in corporate decision making has focused on board involvement in the strategic decision-making process. Power (1987) observed that institutional investors are pressuring boards to challenge managements' strategic leadership. Galen (1989) reported that the courts are increasingly supporting shareholder efforts to get boards more involved. Furthermore, Weidenbaum (1985) argued that the

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best defense against corporate raiders is increased board involvement in the strategic decision process.

Some evidence suggests that boards are responding to these external pressures with greater involvement and less passivity. For instance, Heidrick and Struggles (1990) reported that directors are increasingly involved in determining and monitoring the strategic directions of firms. Similarly, a *Business Week* cover story suggested, "Quietly, many boards are asserting themselves—redirecting strategy here, vetoing an investment there" (Dobrynski, 1989: 66). Worthy and Neuschel (1984) flatly stated that a major increase has occurred in recent years in the duties, power, and responsibilities of corporate boards.

Other evidence, however, indicates that some organizations are resisting increased board involvement in strategic decisions. For example, Lorsch (1989) found that directors wanted to get more involved but are constrained from doing so. Mace (1986) concluded that boards never get involved in strategic decisions unless faced with a crisis. Whisler (1984) reported that one of the universal "rules of the game" is that boards do not get too involved in setting strategy. Similarly, Patton and Baker (1987) argued that board members continue to refuse to "rock the boat" and get involved.

Because board involvement is such a complex phenomenon, we suspected that no one theoretical perspective could adequately capture the process. As a result, this study used two different, and sometimes conflicting, perspectives to describe and explain board involvement in the strategic decision-making process—the strategic choice perspective (Child, 1972) and the institutional perspective (Meyer & Rowan, 1977). With these two complementary perspectives, we hoped to provide a more comprehensive view of board involvement in the strategic decision process. In sum, the purpose of this study was to advance and test relationships predicted by these two perspectives to better explain why and how boards get involved in the strategic decision process.

EXTERNAL PRESSURES FOR BOARD INVOLVEMENT

Although numerous external pressures exist for greater board involvement, researchers have increasingly recognized three institutional forces as catalysts for change. First, because a board is a legal entity governed by state law, the court system greatly affects board behavior. In general, increasing litigation has been directed at boards. For example, it has been estimated that 1 in 20 boards was sued in the 1960s; 1 in 9 was sued in the following decade; and, in the 1980s, 1 in 5 confronted a lawsuit (Kesner & Johnson, 1990). This trend was highlighted by a landmark ruling, known as the Trans-Union case, in which directors were found to be negligent in their involvement in the strategic decision process and were held personally responsible for the damages (Glaberson & Powell, 1985). As a result, directors perceive themselves as having a growing exposure to legal action, often because of insufficient involvement in strategic decision making (Galen, 1989).

Pension funds are a second institutional force pressuring boards to get more involved. In 1970, pension funds owned 17.5 percent of all publicly traded stock. In 1985, they controlled over 33 percent of all public stock, and that figure is projected to increase to 50 percent by the year 2000 (Heard, 1987). Due to the increasing size of pension funds, their managers can no longer sell a firm's stock when they become disenchanted with its top management without a potentially adverse effect on the selling price. As a result, they are waging proxy fights to pressure boards to increase their oversight and involvement (Dobrzynski, 1988).

The market for corporate control is a third major institutional force pressuring boards to become more involved. During the 1980s, hostile takeover activity was at an all-time high (Bhagat, Shleifer, & Vishny, 1989). According to agency theory, hostile takeovers discipline inefficiently run firms by removing control from incumbent executives and directors or threatening to take control (Fama & Jensen, 1983). Thus, hostile takeovers represent a form of corporate governance that substitutes for ineffective board oversight (Brickley & James, 1987). In sum, both real and potential threats of unwanted takeovers pose significant external pressure for greater board involvement.

BOARD RESPONSE TO EXTERNAL PRESSURES

Currently, little conclusive evidence exists regarding how boards in corporate America have responded to these and other pressures for greater involvement in strategic decision making. For example, the authors of most studies of board involvement have speculated about board behavior by examining decisions for which the board is directly responsible, such as those concerning golden parachutes (Cochran, Wood, & Jones, 1985), greenmail (Kosnik, 1987), and top management compensation (Kerr & Bettis, 1987).[1] Although a few field studies have directly examined board involvement (e.g., Henke, 1986; Pearce & Zahra, 1991; Tashakori & Boulton, 1983), these survey studies have suffered from very low response rates (15–21%) and are suspect because they only surveyed a single rater in each organization. In sum, researchers simply do not know what boards' roles are in the strategic decision-making process, nor do we know what influences that involvement.

As discussed previously, we used two prominent theoretical perspectives in this research, the institutional and strategic choice perspectives, to conceptualize board response to external pressures. Interestingly, advocates of each perspective view board response in very different ways, and the hypothesized antecedents of that response vary accordingly. Consequently, we begin with a general description of each perspective and then proceed to specific explanations and predictions regarding board strategic role.

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[1] A golden parachute is a controversial top management perquisite that allows a covered manager to voluntarily resign and collect substantial remuneration. Greenmail transactions are also controversial. Greenmail refers to when a company privately buys back a block of stock from a dissident stockholder who poses an explicit or potential threat to top management's control position.

The Institutional Perspective

The institutional perspective addresses the issue of how and why organizational structures and processes come to be taken for granted and the consequences of this institutionalization process (Meyer & Rowan, 1977; Selznick, 1949, 1957; Zucker, 1987). The key idea behind institutionalization is that much organizational action reflects a pattern of doing things that evolves over time and becomes legitimated within an organization and an environment (Pfeffer, 1982). Therefore, organizational practices can be predicted and explained by examining industry traditions and firm history (Eisenhardt, 1988).

Although there are several different schools of thought within this perspective (Scott, 1987), much of the institutional literature focuses on the concept of isomorphism, whereby organizations conform to the accepted norms of their populations (DiMaggio & Powell, 1983; Rowan, 1982). In effect, an environment legitimates certain ways of organizing. For example, Hirsch (1975) found that industry "gatekeepers" had a major impact on organizational structure and effectiveness. Similarly, Tolbert and Zucker (1983) found that city governments adopted certain organizational structures and processes more than others more because the environment legitimated those structures and processes than because organizational actors took autonomous actions.

However, institutional theorists do recognize that some organizations resist or avoid conforming to external pressures. They explain this resistance in terms of founding conditions and firm history. In other words, a new firm adopts practices common at its time of founding, and this "imprinting" becomes a major influence on the rest of the organization's life (Stinchcombe, 1965). Over time, those practices become the standard way of doing things. Numerous researchers have observed the inertial effects of founding conditions (e.g., Boeker, 1989; Eisenhardt, 1988; Tolbert & Zucker, 1983).

In sum, the institutional perspective is a relatively deterministic theoretical framework that places great emphasis on environmental norms and the weight of firm history as explanations of organizational actions. Institutional theorists see the use of structures and processes that an environment legitimates as sensible because it implies responsible management, pleases external constituencies, and avoids potential claims of negligence if something goes wrong (Eisenhardt, 1988). Given the relatively deterministic assumptions underlying institutional theory, it offers unique explanations and predictions for board behavior that have not yet been explored empirically.

The Strategic Choice Perspective

The strategic choice perspective (Andrews, 1986; Child, 1972) focuses on the actions organizational members take to adapt to an environment as an explanation for organizational outcomes. Its proponents argue that purposeful actions abound in organizations and that organizational members have substantial leeway in shaping their own fates. As such, the perspective focuses attention on individuals and groups within organizations to explain organizational processes. This focus on behavior assumes that organizational actors possess the discretion to act of their own free will (Hambrick & Finkelstein, 1987).

In their landmark study, Miles and Snow identified three fundamental characteristics of the strategic choice perspective. They concluded that this perspective "(1) views managerial or strategic choice as the primary link between organization and environment; (2) focuses on management's ability to create, learn about, and manage the organization's environment; and (3) encompasses the multiple ways that organizations respond to environmental conditions" (1978: 263).

As with the institutional perspective, a number of schools exist within the strategic choice perspective. These schools vary with respect to their conception of the degree and type of deliberateness by which strategies are formed (Mintzberg, 1990). Although it was beyond the scope of this study to address the conflicting viewpoints of these various schools of thought, we noted that most strategy scholars have agreed that for specific strategic decisions, there is first a formation, or prechoice, phase of strategic activity, followed by an evaluation, or postchoice, phase (Fredrickson, 1983). Therefore, researchers have generally accepted a two-phase model of the strategic choice process and given primacy to internal explanations for variations in strategy formation, such as the characteristics of a firm's upper echelon.

In sum, the strategic choice perspective emphasizes nondeterministic explanations of organizational processes and outcomes (Bourgeois, 1984). Strategic choice theorists acknowledge the influence of the external environment, but their focus is on adaptive responses to that environment. In its broadest sense, this perspective represents an evolving, relatively nondeterministic paradigm, or "meta-model," for explaining how organizations adapt to environmental forces (Ansoff, 1987).

An Integration of the Two Perspectives

The two perspectives of interest operate under different theoretical assumptions, but proponents of each appear to be moving closer together. For example, Oliver (1991) argued that institutionalists need to recognize the willful, adaptive behavior some organizations demonstrate. Furthermore, recent empirical work employing the institutional framework has shown that organizations do not passively adapt to their environments (e.g., Covaleski & Dirsmith, 1988; Kurke, 1987; Powell, 1987).

Similarly, strategic choice theorists are recognizing institutional aspects of the strategic decision process. For example, Fredrickson and Iaquinto (1989) characterized the strategic decision process as inertial. Also, Huff (1982) identified industry influences on strategy reformulation and implied that examination of just strategic decision makers was overly narrow. Most recently, Hitt and Tyler (1991) found that industry characteristics significantly influence the strategic decision process.

In summary, these two perspectives appear to offer complementary views of the strategic decision-making process. As Hrebiniak and Joyce (1985) argued, the interaction of deterministic and nondeterministic perspectives must be studied to fully understand organizational behavior. Recognizing this complementarity, Neilsen and Rao described the institutional and strategic aspects of board involvement in the strategic decision-making process to illustrate the "strategy-legitimacy nexus." Therefore, both perspectives may prove to be useful for providing a comprehensive view of board behavior.

HYPOTHESES

In this study, we defined board involvement as the overall level of participation of board members in making nonroutine, organization-wide resource allocation decisions that affect the long-term performance of an organization. This definition *excludes* strategic activities by senior managers acting purely as corporate officers rather than as board members. Although senior managers are highly involved in strategy formation both in and out of the board context, the focus of this study was on their involvement as board members.

Organizational Age and Board Involvement

An organization's age is the number of years elapsed between its founding and the present. Organizational age has proven to be a particularly powerful construct in institutional literature. Numerous studies have shown that it affects organizational processes (e.g., Boeker, 1989; Eisenhardt, 1988; Tolbert & Zucker, 1983). Although the impact of organizational age on board behavior has not yet been empirically studied, the institutional perspective suggests that it influences this process as well.

According to the institutional perspective, founding conditions have a major effect on organizational processes (Zald, 1969). Because organizations change slowly, those founded chronologically earlier than others in different environmental conditions are expected to yield different behaviors than those founded later (Hannan & Freeman, 1984). Several empirical studies support this view. For example, Eisenhardt (1988) found that organizational age was a major predictor of compensation practices in the retail shoe industry. She reasoned that founding conditions were different early in the industry's life cycle than they were later and that this difference led older and younger organizations to adopt different practices. Also, Tolbert and Zucker (1983) found that city governments founded before the institutional environment legitimized civil service reform had more autonomy in choosing their organizational structures than younger city governments.

Because older organizations were formed at a time when external pressures to involve boards in strategy were weaker than they are now, these organizations may demonstrate more resistance to increasing board involvement. In contrast, younger organizations may be more susceptible or open to external pressures for greater board involvement (Hannan & Freeman, 1984). In sum, the institutional perspective predicts that organizational age will be negatively associated with board involvement in the strategic decision process because older organizations were formed at a time when external pressures for board involvement were low, and inertia prevents the organizations from adapting to the new situation (Fredrickson & Iaquinto, 1989).

> *Hypothesis 1: Organizational age is negatively related to board involvement in the strategic decision-making process.*

Level of Diversification and Board Involvement

An organization's level of diversification can be conceptualized as the extent to which it is simultaneously active in many distinct businesses (Pitts & Hopkins, 1982). As a result of the increasing diversification of the largest organizations (Bettis & Prahalad, 1983), this variable has become a central topic of organizational research. Although a rich and growing tradition of research addresses level of diversification, very little is known about its relationship to organizational processes (Ramanujam & Varadarajan, 1989). Recent research in the institutional literature reveals that level of diversification does affect organizational processes (D'Aunno, Sutton, & Price, 1991).

From an institutional perspective, current industry norms influence organizational processes through isomorphism (DiMaggio & Powell, 1983). Several studies, for example, have demonstrated how organizations conform, or become isomorphic, to industry rules or expectations (Huff, 1982; Tolbert, 1985). Thus, the traditional institutional explanation of organizational structure and process focuses on environmental social norms. This explanation is relatively straightforward until one considers the fact that many of today's organizations compete in multiple industries, and hence, multiple institutional environments with varying isomorphic norms.

Advocates of the institutional perspective have argued that diversification to a certain extent dilutes the pressures of environmental isomorphism by making an organization less dependent on any one particular industry (DiMaggio & Powell, 1983). Oliver (1991) explained that activity in multiple environments usually leads to "constituent multiplicity," a term she defined as the number of conflicting constituent expectations exerted on an organization. This multiplicity, she argued, dilutes environmental pressures for a certain way of operating. Consequently, the pressures of environmental isomorphism may be less focused for diversified organizations.

Therefore, the institutional perspective suggests that external pressures for board involvement will be more divergent for diversified organizations than for nondiversified ones. Given this divergence of external pressures, diversified organizations may be freer to ignore pressures for change (Oliver, 1991). In sum, the institutional perspective predicts that an organization's level of diversification will be negatively associated with board involvement because isomorphic pressures should be more diffuse for diversified firms than for nondiversified ones.

> *Hypothesis 2: An organization's level of diversification is negatively related to board involvement in the strategic decision-making process.*

Insider Representation and Board Involvement

The proportion of insider representation on a board is undoubtedly the most widely studied variable in the corporate governance literature. Researchers have generally defined insiders as board members who are current or former employees of a firm or who are otherwise closely affiliated with the firm (Cochran, Wood, & Jones, 1985). In recent years, external stockholders have put increasing pressure on firms to reduce the numbers of inside directors on their boards under the assumption that outsiders provide more objective oversight of the strategic decision process than insiders. For example, Heidrick and Struggles (1990) reported that the proportions of insiders on the boards of the largest U.S. corporations steadily decreased throughout the 1980s from 31 percent to an average of 21 percent in 1989.

Unfortunately, observers of this trend have largely speculated about the impact of insider representation on board behavior, and the empirical results have been equivocal (Zahra & Pearce, 1989). Fortunately, the strategic choice perspective offers theoretical insights into this relationship by focusing more intensively on organizations' internal group dynamics than the institutional perspective. Strategic choice advocates have argued that insiders contribute valuable insights and information to boardroom discussions and hence allow boards to be more involved in the strategic decision process (Baysinger & Hoskisson, 1990). As a result, a balance between informed discussants of strategy and objective monitors of strategic behavior emerges (Rosenstein, 1987).

This internal balance argument has some empirical support in the literature. For example, Ford (1988) found that insider representation was positively associated with board involvement in the strategic decision process for *Inc.* 500 firms. Also, Tashakori and Boulton (1983) found that higher proportions of insiders on boards were associated with greater board participation in the strategic planning process. Furthermore, insider representation was found to be positively associated with the innovativeness of strategies (Hill & Snell, 1988) and amounts of strategic change (Goodstein & Boeker, 1991) and negatively related to the incidence of golden parachutes in *Fortune* 500 firms (Cochran et al., 1985). More recently, Baysinger, Kosnik, and Turk (1991) found that insider representation was positively related to the level of corporate R&D spending. Each of these studies has suggested that boards were more effective and involved when insiders were better represented because there may have been better information flows within the boardrooms. In sum, according to the strategic choice perspective, insider representation on a board may be positively related to board involvement.

> *Hypothesis 3: Insider representation is positively related to board involvement in the strategic decision-making process.*

Board Size and Board Involvement

Board size is simply the number of members a board has. Although many studies have examined this structural variable (Zahra & Pearce, 1989), results have been largely equivocal. Once again, theorists have speculated about the variable's impact, but no empirical study has directly examined its actual effect within a theoretical framework. Thus, we turned to the group dynamics literature for an explanation of this relationship.

Previous research on group decision making has shown that large groups may experience low motivation (Herold, 1979) and problems with coordination and organization (Hackman & Morris, 1975). Thus, as group size increases, the level of members' participation often decreases (Gladstein, 1984).

Several researchers have noted the negative impact of too large a board on board involvement. For example, Herman (1981) reported that large Fortune 500 boards were too cumbersome to conduct effective discussions. Similarly, Kovner (1985) found that large hospital boards were generally ineffective in making strategic decisions in a timely fashion. Other observers (e.g., Lauenstein, 1977; Reed, 1978) have noted that oversized boards slow down decision making and reduce individual commitment. Thus, board largeness may inhibit effective participation by board members in the strategic decision process because of its negative impact on group dynamics.

> *Hypothesis 4: Board size is negatively related to board involvement in the strategic decision-making process.*

Board Involvement and Financial Performance

Perhaps the most controversial issue surrounding board strategic role concerns board involvement and its impact on the financial performance of organizations (Zahra & Pearce, 1989). Clearly, many issues influence financial performance, such as competitive intensity and organizational size, but the incremental impact of board behavior on organizational performance is unclear. For the fifth and final hypothesis, we used the strategic choice perspective to predict and explain this relationship.

According to the strategic choice perspective, strategic decision makers seek to optimize their firms' financial performance (Hambrick & Mason, 1984). A fundamental assumption of this perspective is that organizational strategy and its processes affect financial performance (Miles & Snow, 1978). All else being equal, better-managed organizations are assumed to achieve higher levels of financial performance.

Andrews (1986) contended that boards are important and neglected strategic resources within firms. The primary basis for this argument is that increased board involvement forces managers to check their assumptions and do their homework before advancing strategic proposals. In addition, outside directors bring an objectivity to the decision-making process that can help to challenge narrow thinking, escalating commitment, and weak analysis (Baysinger & Hoskisson, 1990). These researchers have suggested a positive relationship between board involvement and the financial performance of an organization.

This proposition has some empirical support. Studying the banking industry, Pearce (1983) found that the attitudes of board members were associated with different levels of bank profitability. Also, Pearce and Zahra (1991) found that board involvement for *Fortune* 500 firms was positively related to firm performance after controlling for industry at the two-digit Standard Industrial Classification (SIC) level. Similarly, Baysinger and Butler (1985) concluded that boards affect financial performance when they found that decreases in insider representation were associated with increases in financial performance. Furthermore, Lynch (1979) studied two organizations over two and a half years and observed increasing sales and profitability in the aftermath of increasing board involvement in the strategic decision process. Given these preliminary findings, we expected a positive relationship between board involvement and organizational performance because involved boards increase diversity of opinion in the strategy formation process and oversight and objectivity in the strategy evaluation process.

> *Hypothesis 5: Board involvement in the strategic decision-making process is positively related to an organization's financial performance.*

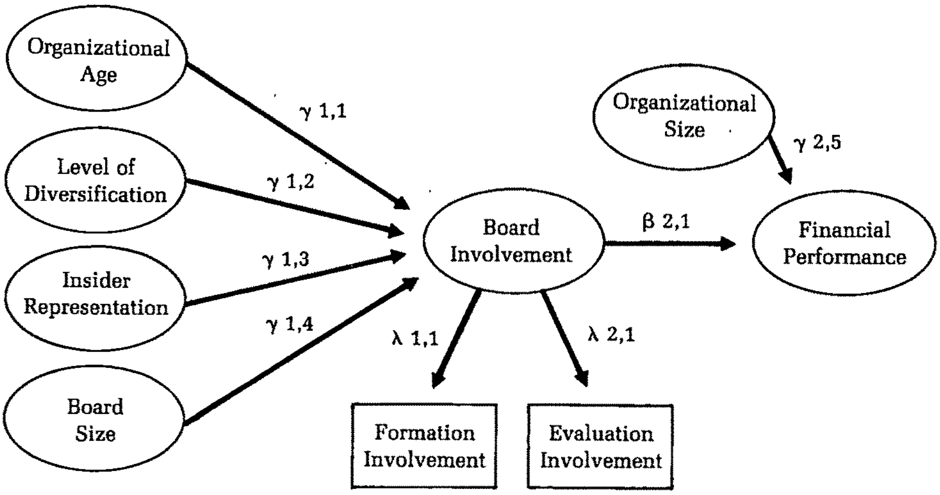
Figure 1 graphically depicts the theoretical relationships examined in this study. As was discussed previously, strategic choice can be conceptualized as occurring in two major phases: the formation phase, when prechoice direction-seeking activities occur, and the evaluation phase, when postchoice monitoring activities occur. Consequently, board involvement can be conceptualized as involvement in one or both of these phases of the decision-making process. In summary, this study examined four potential antecedents and the financial effect of board involvement in the strategic decision-making process.

RESEARCH METHODS

For this study, both qualitative and quantitative data were collected on multiple cases of board involvement with strategic decisions. This approach is consistent with that taken by both institutional (Selznick, 1957) and strategic choice (Harrigan, 1983) advocates, who have conducted fine-grained, holistic studies.

Board involvement was retrospectively classified within the formation and evaluation phases of the strategic decision process. We based our measure of board involvement on the combined assessments of the chief exec-

FIGURE 1
Model of Board Involvement in the Strategic Decision-making Process



utive officer (CEO), an inside director, and an outside director. This method of measuring board involvement represents an improvement over previous methods of either speculating about board behavior (e.g., Kesner & Johnson, 1990; Kosnik, 1987) or surveying single board members, such as CEOs (e.g., Pearce & Zahra, 1991; Tashakori & Boulton, 1983) or chairpersons (e.g., Henke, 1986).

Sample Selection

Four organizational populations were examined for differences across the four predictor variables. We obtained lists of four diverse organizational populations, randomly selected 25 organizations from each list, and then compared the mean levels of board size, board composition, organizational age, and level of diversification among the four samples. Because the samples differed significantly across the four independent variables, we retained the groups for further study. The four populations selected for this study were (1) general medical hospitals, (2) biotechnology firms, (3) textile firms, and (4) large, diversified firms from the *Fortune* 500. Table 1 lists comparative statistics for these four organizational populations and the sources used to define each population, and Table 2 shows characteristics of the four samples.

Privately owned general medical hospitals were selected because they have relatively large boards with relatively low insider representation. As Table 2 shows, insiders typically represented only 10.4 percent of the membership of hospital boards; the other three populations contained much higher levels of insider representation ($p < .001$).

Publicly held new biotechnology firms were also selected for their

TABLE 1
Characteristics of the Four Research Populations[a]

Dimensions	Biotechnology Firms	General Hospitals	Textile Firms	Diversified Firms
Number of organizations[b]	300	6,800	424	77
Publicly owned	[75]	684	[40]	[77]
Privately owned	225	[5,508]	384	
Government-owned		408		
Total sales in billions	$0.4	$181.0	$62.7	$336.9
Average sales in millions	$1.3	$26.6	$147.8	$4,375.3

[a] All figures are for 1986. Sources of data for the four groups were respectively *U.S. Industrial Outlook* (U.S. Department of Commerce, 1987); *Standard & Poor's Industry Surveys* (Standard & Poors, 1987); *Ward's Business Directory* (Information Access Company, 1987); and *Analysis of Diversified Firms* (Shearson Lehman Brothers, 1987).

[b] Bracketed numbers indicate the organizations examined in this study.

unique organizational characteristics. Typically 7.9 years old and operating boards with only 7.0 members, these firms were younger than those in the other three populations and had smaller boards ($p < .001$). In addition, these organizations were typically less diversified than those in the other populations ($p < .001$).

The third population, publicly held textile firms, offered a unique opportunity to explore board role where insider representation was relatively high. The average textile board was composed of 66.7 percent insiders, a level of insider representation significantly higher than that of the other three groups ($p < .001$). In addition, textile organizations were the oldest organizations studied, with an average age of 62.6 years ($p < .001$).

Finally, publicly owned *Fortune* 500 firms offered the opportunity to study organizations that were more diversified than the members of the other three organizational samples ($p < .001$).

TABLE 2
Characteristics of the Four Samples[a]

	Biotechnology Firms		General Hospitals		Textile Firms		Diversified Firms	
Variables	Means	s.d.	Means	s.d.	Means	s.d.	Means	s.d.
Board size	7.00	2.36	12.90	3.67	9.50	2.92	12.80	3.55
Insider representation	42.9%	17.27	10.4%	8.49	66.7%	19.63	37.5%	20.41
Level of diversification	0.20	0.30	0.42	0.07	1.25	0.65	2.30	0.35
Organizational age	7.90	2.65	54.70	25.38	62.60	45.54	51.10	27.31

[a] All figures are for 1986.

Data Collection

Organizations were randomly selected from each of the four populations. We limited the hospital sampling to a large southeastern state; there were no geographical restrictions on the other three samples. Graeff (1980) argued that three key variables determine the generalizability of hospital samples: size, ownership, and technical domain. After testing for differences in size, defined as number of beds, ownership structure (private versus public), and technical domain (general versus specialized), we found no significant differences between the state's population and the national population. Therefore, all four samples should be generalizable to their respective national populations.

We began the data collection by randomly selecting 13 organizations within each of the four sets of 25 and mailing a solicitation letter to the CEO of each organization. After conducting telephone follow-ups two weeks later, we identified participants and nonparticipants. When an organization decided to not participate, we issued another solicitation letter to an organization in the remaining set within the same population. In this manner, we solicited 75 organizations until we achieved our quotas for each population.

Overall, 42 firms were studied in four very different institutional contexts. The original design called for 40 organizations, 10 from each population, but the high response rate from the hospitals permitted the addition of two organizations. The overall response rate of the solicited organizations was 56.0 percent. To check for response bias, we compared the responding firms to the nonrespondents on the four predictor variables and organizational size, measured as the logarithm of number of employees. No significant differences were found. Therefore, the organizations that participated appear to be representative of their respective populations.

Within each organization, we interviewed the CEO, an insider, and an outsider, using a semistructured interview format. The CEO was the initial informant contacted. At the conclusion of the interview, we asked the CEO to identify the most significant strategic decision made during the study period, defined as 1985 through 1987. We then asked the CEO to identify the inside director and the outside director who were most involved in making this strategic decision and asked for permission to interview them. We conducted 42 personal interviews with the CEOs and conducted the remaining interviews with 72 directors over the telephone. Because 12 organizations did not have any insiders on their boards, we interviewed only two individuals at those organizations. Overall, 114 CEOs and directors were interviewed; the average interview lasted 47 minutes.

To help insure accurate and valid classifications of board involvement, we took several precautionary steps (Huber & Power, 1985). First, each respondent was asked to describe, in his own words,[2] his firm's normal strategic decision process and the role the board played in that process. Next, the interviewer provided the respondent a list of statements describing board involvement and asked him to pick the one that best described his board.

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[2] All the respondents were men.

If the respondent's classification fit his earlier general description, the interview proceeded. Discrepancies rarely occurred; if one did, the interviewer probed to resolve the discrepancy, a process that was aided by having two interviewers present at half the personal interviews with the CEOs. Furthermore, to limit recall distortion on the part of respondents, we limited the time frame of the study to three years, 1985–87, and collected data immediately after the study period, during ten months in 1988. In addition, we used multiple raters, comparing the classifications of different board members.

In sum, a fairly labor-intensive data collection process was used to classify levels of board involvement. We took this approach because board behavior is a complex and sensitive subject, and there is a critical need for reliable and valid data on actual involvement. Because we conducted in-depth interviews with multiple raters, we believe that the validity and reliability of the current data offer a unique window into the boardroom.

Data Analysis

The data were analyzed using a procedure of general maximum likelihood, LISREL VI (Jöreskog & Sörbom, 1984). We chose this analytical procedure for two reasons. First, LISREL is particularly useful for studying models with latent variables and measurement errors. Because board involvement was a latent construct, this procedure was appropriate. Second, this procedure offers a relatively elegant way for testing a complex set of simultaneous equations. In particular, the intervening effects of board involvement made this approach necessary.

This study first tested the theoretical model depicted in Figure 1. The chi-square assessment of fit indicates whether a model fits the data; the degree to which the observed relationships differ from those hypothesized indicates the degree to which the model is a misrepresentation (Keats & Hitt, 1988). If there is a poor fit, an iterative modification process may be used to reveal the model suggested by the data (Jöreskog & Sörbom, 1984). In addition to this quantitative investigation, we used interview comments to help interpret the results.

Variables and Measures

Board involvement was determined by averaging the involvement intensity score across the board members within each of the 42 organizations. Two scales were constructed: one for involvement in the formation stage of the strategic decision-making process, and one for involvement in the evaluation stage. The two scales were developed in pilot interviews with members of one organization in each of the four populations. Drawing on previous research (e.g., Henke, 1986; Lynch, 1979; Mace, 1986; Patton & Baker, 1987; Tashakori & Boulton, 1983; Whisler, 1984) and the pilot interviews, we developed two anchored, seven-point involvement scales, one for each phase of the strategic decision-making process. We gave or read a sheet describing these measures to all respondents, and they independently indicated perceived levels of their boards' involvement during the study period. The Appendix gives the complete scales.

Because these were new, single-item, multirater assessments, obtaining interrater reliability statistics was necessary. For the formation phase, the interrater reliability was .73. For the evaluation phase, the interrater reliability was .84. Nunnally (1967) indicated that for basic research, such as this study, these reliability levels are acceptable. Therefore, we judged the directors to be reliable estimators of board involvement in the formation and evaluation phases and averaged the ratings across directors for each organization.

The analyses included four independent variables: insider representation, board size, level of diversification, and organizational age. We defined *insider representation* as the percentage of insiders and affiliated outsiders on a board in 1985. Like Cochran and colleagues (1985), we classified outsiders as "affiliated" when they met any of the following conditions: (1) they were former employees of the organization, (2) they possessed contractual relationships with the organization, or (3) they were major suppliers to the organization. Because such affiliated persons may not possess the independence to act independently of a firm's management, they were counted as insiders. *Board size* was defined as the total number of directors on a board in 1985. We obtained information on board size and composition from proxy statements and organization records.

Level of diversification was measured using the entropy measure (Palepu, 1985), which has been found to be a reliable and valid measure of firm diversification (Chatterjee & Blocher, 1991). We based the entropy calculation on sales in each four-digit SIC category in which an organization sold. The data were restricted to percentage of organizational sales in 1985 because the SIC system changed substantially in 1986, so comparisons before and after this date can be meaningless. For the three for-profit samples, sales data came from the Establishment data base (Economic Information Systems, 1985). For the hospitals, data came from organizational records. We computed *organizational age* by subtracting the year in which an organization was founded from 1985. The years of founding were obtained from Moody's *Industrial Manuals* for the public firms and from organizational records for the private hospitals.

Organizational performance was measured as an organization's average return on assets over a five-year period (1985–89) divided by the primary industry's average return on assets over that same period. Following Keats and Hitt (1988), we determined the primary industries by examining sales distributions by four-digit SIC categories and selecting the one with the largest proportion of sales. By computing financial performance relative to an industry, we essentially controlled for industry effects. In addition, we also controlled for organizational size by including the logarithm of the number of employees in 1986 in analyses. The inclusion of the privately held hospitals precluded the use of a market-based measure of financial performance.

RESULTS

Level of Board Involvement

Formation involvement. The mean response for board involvement in the formation phase was 3.72 (s.d. = 0.96) for the 42 boards included in this study. According to our respondents, roughly 40 percent of the boards merely ratified management strategic proposals; the next 30 percent revised and ratified; and the remaining 30 percent apparently worked with management to develop strategic direction.

The essence of the debate over the role of a board in formulating strategic direction is the delineation of management and board responsibilities. Several respondents used analogies to explain this delicate balance of responsibility. One CEO from a diversified firm explained, "Strategy is like an onion. The outer shell is the board's province; the inner layers are management's responsibility." The definition of which layers of the onion were for top managements and which were for the boards was not clear, however, and the division of layers varied considerably across the organizations. In keeping with this analogy, the boards that were most involved tended to see their responsibility as several layers into the strategy onion, and the less involved boards were content to deal with only the outer layer.

Evaluation involvement. The mean response for board involvement in the evaluation phase was 3.29 (s.d. = 0.73). According to our respondents, nearly 70 percent of the boards merely accepted whatever evaluation top management gave them. The next 27 percent specified the information that they wanted for the evaluation but accepted the data they received. Only 4 percent of the surveyed boards both specified and probed management evaluations of prior strategic investments.

During the evaluation phase, the boards appeared to trust management to give them the necessary and appropriate evaluation reports. In fact, trust was the most recurrent theme of the directors' comments during the interviews. Most directors attributed this trust relationship to outside directors' lack of knowledge and information about the businesses. According to one inside director on a textile board, "Management is spending 8 to 15 hours per day on the business. Our board meets once a month. Who do you think is more knowledgeable about the business? Directors need to evaluate projects based on an implicit trust of management. If that trust fails, everything goes to hell."

In summary, the extent of board involvement varied across the organizations. In a highly involved board, members worked in partnership with management to develop a strategic direction and then closely questioned top management about the progress of the strategic investments that had been made, trusting management to supply comprehensive and accurate evaluations. In contrast, a less involved board tended to rubber stamp management's strategic proposals and accept whatever evaluations top management gave it. The next section explores some antecedents of involvement.

Antecedents of Board Involvement

Table 3 identifies the means, standard deviations, and correlations for all eight measures of interest to this study. After an r-to-z transformation (Cohen & Cohen, 1983), the average correlation between exogenous construct indicators was 0.28, indicating that multicollinearity was not a significant problem.

To assess the overall fit of the model, we examined several fit indexes. The chi-square statistic with 10 degrees of freedom was 17.53 ($p = .063$), and the goodness-of-fit index was .913, suggesting a reasonably good fit of model to data. In addition, the normed fit index (James, Mulaik, & Brett, 1982) was .925, sufficiently above the .9 heuristic level (Bentler & Bonett, 1980). However, the results of these tests should be treated with caution because they sometimes lead to faulty conclusions when a sample is too small (Harris & Schaubroeck, 1990).

Therefore, we computed the noncentralized normed fit index (NCNFI) for our model as: $NCNFI = [(F_n - df_n) - (F_t - df_t)]/(F_n - df_n)$, where F_n is the chi-square for the null model, df_n is the degrees of freedom for the null model, F_t is the chi-square for the target model, and df_t is the degrees of freedom for the target model. Recent research on fit indexes indicates that the NCNFI removes the bias that can occur for small samples (McDonald & Marsh, 1990), and other LISREL studies have successfully used this index (e.g., Bagozzi, Yi, & Phillips, 1991). In our study, the value of the NCNFI was .94, indicating an acceptable fit. Because LISREL is primarily a confirmatory modeling method (Harris & Schaubroeck, 1990), we decided to not add additional structural relationships just to improve the fit index results.

Table 4 gives the structural parameter estimates for the maximum likelihood solution. Hypothesis 1 predicts that organizational age will be negatively associated with board involvement. Consistent with the first hypothesis, organizational age was associated with board involvement. However, the relationship was positive and relatively weak ($p < .10$). Hypothesis 2 predicts that level of diversification will be negatively related to board involvement. Our data strongly supported the second hypothesis, as evidenced by the negative, significant coefficient ($p < .01$).

Hypothesis 3 predicts that insider representation will be positively associated with board involvement. Interestingly, the coefficient for the effect of insider representation on board involvement was negative and significant ($p < .01$), contrary to prediction. However, Hypothesis 4 predicts that board size will be negatively related to board involvement, and our data supported this relationship ($p < .05$).

Table 4 also reveals that board involvement was positively related to financial performance with industry effects and organizational size controlled. This association, however, was fairly weak ($p < .10$). Although causality cannot be assumed because the measures are based on cross-sectional

TABLE 3
Means, Standard Deviations, and Correlations[a]

	Overall		Hospitals		Biotechnology Firms		Textile Firms		Diversified Firms		Overall Correlations						
Variables	Means	s.d.	Means	s.d.	Means	s.d.	Means	s.d.	Means	s.d.	1	2	3	4	5	6	7
1. Formation involvement	3.72	0.96	4.46	0.52	3.60	1.20	3.65	0.88	3.03	0.60							
2. Evaluation involvement	3.29	0.73	3.60	0.67	3.41	1.15	3.05	0.46	3.03	0.29	.55***						
3. Level of diversification	1.01	0.87	0.43	0.06	0.26	0.33	1.32	0.58	2.18	0.53	−.36*	−.33*					
4. Organizational age	42.81	32.46	49.17	27.88	8.50	3.53	51.80	35.42	60.50	28.00	.09	−.13	.48**				
5. Board size	11.02	4.31	14.00	4.63	7.30	2.98	9.30	2.71	12.90	2.81	−.04	−.28	.19	.27			
6. Insider representation	39.46	24.83	14.93	0.56	48.24	18.63	63.90	19.38	35.67	20.00	−.42**	−.27	.15	−.17	−.36*		
7. Organizational size	7.45	2.20	7.30	0.56	4.72	1.46	7.61	1.37	10.20	0.97	−.34*	−.38*	.81***	.53**	.54**	−.11	
8. Financial performance	0.85	1.44	1.46	0.63	0.19	2.71	0.87	0.63	0.73	0.53	.12	.14	−.08	.13	.19	−.07	.05

[a] Overall $N = 42$; for industry groups, Ns = 12, 10, 10, and 10, respectively.

* $p < .05$

** $p < .01$

*** $p < .001$

TABLE 4
LISREL Parameter Estimates[a]

Relationships with Board Involvement	Hypothesis	Hypothesized Relationship	LISREL Parameter	Unstandardized Parameter Estimate
Antecedents				
Organizational age	1	Negative	$\gamma_{1,1}$	0.01†
Level of diversification	2	Negative	$\gamma_{1,2}$	−0.43**
Insider representation	3	Positive	$\gamma_{1,3}$	−0.02**
Board size	4	Negative	$\gamma_{1,4}$	−0.06*
Effects of financial performance	5	Positive	$\beta_{2,1}$	0.15†
Control with organizational size			$\gamma_{2,5}$	0.18*

[a] N = 42. The coefficient of determination for all structural equations is 0.52.
† $p < .10$
* $p < .05$
** $p < .01$

data, this finding is consistent with our fifth hypothesis, which predicts that organizational actors can influence organizational outcomes.

DISCUSSION

Summary of Findings

Three major points emerge from this study. First, the institutional perspective appears to offer a partial, but informative, explanation of board involvement in the strategic decision process. Notably, we found that organizational age was positively associated with board involvement. It appears that boards may become more involved as an organization ages because the organization undergoes a wide range of circumstances over time and organization members develop a broad repertoire of skills.

One outside director commented, "Our prior board agreed with management at all times—that is why we got into the mess that we did at the end of the 70s. We've learned from that; it won't happen again." This particular organization experienced a severe environmental jolt in the late 1970s and made many changes in response to it, such as increasing the level of board involvement. Thus, it appears that it may take an environmental jolt to change an inertial organizational habit (Meyer, 1982). More specifically, boards may assist organizations in unlearning previous organizational habits that are no longer functional (Nystrom & Starbuck, 1984). This argument suggests that the inertial view posited by the institutional perspective is overly simplistic, as Oliver (1991) argued.

Consistent with the institutional perspective, however, is our finding that an organization's level of diversification is negatively associated with the overall level of board involvement. According to this perspective, diversification may diffuse isomorphic pressures and hence, lower the pressures to increase board involvement. It appears that the diversification of financial risks also brings with it a diffusion of external pressures for high board involvement.

Commenting on the board's involvement in a large diversified firm, one CEO candidly stated, "The board should do it our way. Board participation in the formulation of strategy is not necessary; discussion of the proposal may or may not be needed." In contrast, the CEO of a relatively nondiversified organization declared, "In our organization, we follow a basic rule: management proposes; the board disposes. Our community wouldn't let us do it any other way." These comments reinforce the notion that diversification dilutes institutional pressures for greater board involvement.

This empirical support for the institutional environment's impact on board involvement may help to explain why there has been so much conflicting evidence in previous governance studies. Because previous researchers have not considered the impact of different institutional environments and organizational histories, they may have given undue emphasis to internal factors. Future work needs to explore such things as industry regulations, professional norms, community expectations, and ownership patterns as they work to influence the corporate goverance process.

The second major point is that several predictions were also supported for the strategic choice perspective. For example, the level of insider representation on a board was found to be negatively related to overall board involvement. In the strategic choice framework, the composition of a group affects group behavior. However, previous strategic choice research that speculated about actual board behavior suggested that high representation of insiders on a board led to greater board involvement in strategic decision making. In contrast, our study found the opposite relationship.

The interview data reinforce and explain these findings. For example, the CEO of a textile firm graphically stated, "Inside directors are eunuchs. They contribute nothing to the board's strategic role because they are too worried about challenging my authority." In contrast, the CEO of a hospital board explained, "We are careful to not put doctors in a majority position on any board committees. We want community representatives to dominate decision making in this hospital, not administrators or physicians." Apparently, managers do not have to be members of a board for the board to become more involved in the strategic decision process.

We also found that the size of a board was negatively associated with board involvement. As the group dynamics literature has suggested, when boards get too large, effective debate and discussion may be limited, and the level of board involvement may decrease (Harrison, 1987). Our data appear to support March and Simon's (1958) proposition that the larger a group, the lower the interaction between individual members. Illustrating the dysfunctional aspects of large boards, a CEO explained, "We have 24 people on our board. They are a broad cross-section of businessmen, preachers, doctors, educators, blacks, and women. They are simply too big of a group to discuss strategic issues, let alone make decisions." Thus, the strategic choice perspective's concern about internal group dynamics appears to be well placed, particularly with respect to the impact of group size.

In addition, board involvement was found to be positively related to the financial performance of an organization. The CEO of a relatively high-performing organization stated, "We have a super board. They help us [top management] to avoid mistakes. The board serves as a sort of discipline for our management team. They are definitely contributors to our success." In contrast, an outside director for a relatively low-performing organization complained, "The board would like to take a different approach to the business and be more involved than it has in the past, but the CEO doesn't listen to us very carefully." In sum, it appears that active and involved boards are associated with high performance. It is still not clear if high board involvement is a cause or an effect of high performance, but the strategic choice perspective suggests that boards can and do influence performance.

Finally, the institutional and strategic choice perspectives appear to be complementary because our data supported predictions from both perspectives. Several researchers have suggested this complementarity between deterministic and nondeterministic theoretical perspectives (e.g., Hambrick & Finkelstein, 1987; Hrebiniak & Joyce, 1985; Keats & Hitt, 1988). Although this study examined a very specific aspect of strategic management, namely, board involvement in the strategic decision-making process, these findings may encourage institutional theorists to examine less deterministic explanations for organizational phenomena (Perrow, 1985) and may encourage strategy researchers to explore the impact of institutional constraints and influences on strategic actors (Fredrickson & Iaquinto, 1989).

Perhaps one CEO best captured the complementarity of these two theoretical perspectives when he stated, "Our board has become more involved for two reasons. First, legal liability concerns have sharpened our attention. Second, the increasing complexity of doing business requires more thought and discussion than it did in the past." Interestingly, the first reason supports the institutional perspective, and the second is consistent with the strategic choice perspective. Thus, boards appear to be both institutionally responsive and strategically adaptive.

Conclusions and Limitations

The results of this research suggest a variety of issues. One central issue is how to characterize board involvement. Previous studies have focused on internal power arrangements and have speculated about board involvement by looking at such structural features as insider representation or by examining specific decisions for which boards are responsible (e.g., greenmail decisions). The present research offers an alternative way to conceptualize board involvement in the strategic management process. Like Mintzberg (1979), we believe that field interviews are critically important for helping to explain complex organizational processes, such as a board's strategic role.

Both the institutional and strategic choice frameworks appear to be useful for explaining board involvement in the strategic decision process. Within this context, researchers can view board involvement as either an institutional response or a strategic adaptation to external pressures. Institutional theory suggests that organizations resist these pressures to the extent that firm traditions, the environmental context, or both support such resistance. Strategic choice theory suggests that organizations adapt to pressures to the extent that organizational actors correctly perceive and manage the necessary changes. This study is the first direct investigation of actual board behavior applying convergent insights of institutional and strategic choice perspectives to explain board involvement in strategic decision making. Future studies should attempt to examine further the potential consistencies or differential predictions of these frameworks to shed light on these and other determinants of board involvement in other organizational populations. For example, stock ownership may be an important determinant to investigate because it has implications in both institutional and strategic choice terms for board behavior.

Several limitations of this study should be noted. First, the dependent variable was based on the perceptions of three board members per firm. These respondents may not have provided entirely accurate or unbiased characterizations of board behavior. However, the use of multiple respondents and open-ended interviews to probe for potential response bias helped to minimize this problem. Second, the study's proposed relationships need to be examined in a range of environmental contexts to determine its generalizability. Our examination of four distinct populations differing in terms of board size and composition, level of diversification, and organizational age provides an initial exploration of the study's variables across diverse environmental contexts. The relatively dramatic differences among these contexts reinforces the importance of examining variation in board involvement across a variety of populations, but larger samples are clearly needed to test the robustness of our results.

Third, we confined our investigation to a three-year period to permit in-depth qualitative interviews with respondents and to minimize recall distortion and data inaccuracies in measuring board involvement. Studies incorporating longer time frames may shed light on board dynamics emerging in response to increasing external pressures for board involvement over time. Finally, our measure of organizational performance was limited to economic profitability. Future research might extend this measure to incorporate the contributions of board involvement to the noneconomic or social performance of an organization (Kohls, 1985; Neilson & Rao, 1987).

In conclusion, this research made at least three theoretical contributions. First, we examined board strategic role using multiple theoretical frameworks. On the basis of this approach, board involvement was reconceptualized as either an institutional response or a strategic adaptation to external pressures for greater board activity. In this process, several common predictors of board involvement, including board size and insider representation, were given new meaning. In addition, we explored two new predictors of board involvement, level of diversification and organizational age. Perhaps most interestingly, this study supported predictions from both the institutional and strategic choice perspectives. Thus, both perspectives appear to be necessary to describe and explain board strategic role.

Second, we studied actual board involvement through extensive field interviews with CEOs and directors. In the past, research has speculated about board involvement, and several studies have recommended direct study of board strategic role. This research responded to that recommendation and provided some direct evidence about board behavior in four diverse environmental contexts. Interestingly, board members could reliably and accurately characterize the politically sensitive issue of board involvement in the strategic decision process.

Third, all else being equal, board involvement in the strategic decision process was found to be marginally related to financial performance. Unfortunately, we cannot tell if the weakness of this relationship is due to shortcomings in the strategic choice perspective or to the low statistical power created by our relatively small sample. Future research is needed to better understand this relationship.

Despite the scope and contributions of this research, it has raised a variety of issues that require additional investigation. Clearly, both the institutional and strategic choice perspectives should be parts of future research on board involvement. As an increasing number of organizational theorists have noted, these perspectives appear to offer complementary views of organizational activities. Working together, they appear to offer a more complete view of board behavior than each does operating separately. In sum, this study is an empirical and theoretical first step toward an explanation of board involvement in the strategic decision-making process.

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APPENDIX
Board Involvement Scales

We gave respondents the following introductory comments: "For the purposes of this study, strategic decisions are defined as nonroutine, resource allocation decisions that should affect the long-term performance of the organization. Based on that definition, please select the statement listed below that best describes your board's general level of involvement in strategic decision making during the 1985 to 1987 period."

Formation of New Strategic Decisions

1. The board is usually not involved with the formation of strategic decisions.
2. The board usually ratifies strategic proposals that are formed solely by top management.
3. The board usually asks probing questions and then ratifies strategic proposals that are formed primarily by top management.
4. The board usually asks probing questions which lead to revisions of strategic proposals that are formed by top management.
5. The board usually helps to form strategic decisions with top management in board meetings.
6. The board usually helps to form strategic decisions with top management within and between board meetings.
7. The board usually forms strategic decisions separate from top management.

Evaluation of Prior Strategic Decisions

1. The board is usually not involved with monitoring the progress of strategic decisions.
2. The board usually accepts the evaluation given to it by top management without asking probing questions.
3. The board usually accepts the evaluation given to it by top management after asking probing questions.
4. The board usually determines the timing and criteria of evaluation, but that information is supplied by top management and it is rarely challenged by the board.

5. The board usually determines the timing and criteria of evaluation, but that information is supplied by top management and it is often challenged by the board.
6. The board usually determines the timing and criteria of evaluation and it often requests additional information after receiving the progress report from top management.
7. The board usually collects its own information about the progress of the strategic decision in addition to top management reports.

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ORGANIZATIONAL INTEGRATION AND PROCESS INNOVATION

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Mechanisms for the successful adoption of process innovation were investigated. Since firms buy most new technologies for manufacturing operations, it is difficult for them to use these technologies to achieve competitive advantage because it is difficult to protect them from imitation and circumvention. We suggest that successful organizations use four integrating mechanisms of two types to capture the value from process innovations, (1) making process innovation a unique occasion for significant restructuring and (2) creating effective new patterns from the many alternative ways of accomplishing these changes. Findings supported the idea that three upstream integrating mechanisms directed at the value-added chain—new hierarchical structure, increased coordination between design and manufacturing, and greater supplier cooperation—positively affect the productivity of new manufacturing systems, and one market-directed, downstream mechanism, forming new customer alliances, positively affects new system flexibility. Guidelines for future research are discussed.

Change is an essential feature of organizational life. New products and materials, new processes, new services, and new organizational forms continue to be among the preferred alternatives that organizations use to compete with each other and to satisfy customers. Consequently, there has been a considerable, sustained flow of popular as well as professional writing and discussion about innovation. In particular, work on R&D and new products (e.g., Roussel, Saad, & Erickson, 1991; Gattiker & Larwood, 1988), new services (e.g., Nord & Tucker, 1987; Damanpour, 1987) and new processes (e.g., Czepiel, 1975; Davis, 1986; Dewar & Dutton, 1986) continues to appear. Every year, billions of dollars are spent on process innovation in manufacturing (Malone, 1987). In this study, we concentrate on this type of change, giving special attention to the issue of how organizations capture the value from innovating in the manufacturing sector. In some ways, new products

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and processes, especially radical departures from existing practices (Damanpour, 1991), are hard to separate. They tend to follow closely related life cycles (Anderson & Tushman, 1990; Ettlie, Bridges, & O'Keefe, 1984; Tushman & Anderson, 1986).

There seems to be little doubt now that the introduction of process innovation, especially in manufacturing, can have a substantial impact on productivity. The documented historical cases alone argue for, and predict, large gains. For example, the introduction of fluid catalytic cracking processes in the 1940s resulted in a 98 percent savings in labor costs, an 80 percent savings in capital costs, and a 50 percent savings in material inputs per unit output (Freeman, 1982: 27). By the same token, it is also widely recognized that the diffusion and successful application of process technology in industry depend on "big changes in structure and administrative practices" (Nabseth & Ray, 1974: 310). Applications of the steam engine, for example, required significant reorganization of factory production.

This adaptation process is replicated each time a new generation of throughput technology is installed in industrial production, but there appears to be a growing sense among researchers that the current generation of process innovations in durable goods and discrete, product production represents a unique chapter in this history. For example, Goodman and Sproull wrote that "there is a class of technology that is qualitatively different from previous ones and for which new dimensions (e.g., of complexity) may be necessary. This is the class of technologies based on programmable machinery" (1990: 256). The reason those authors argued that programmable machinery is different is that these systems are not based on mechanical models. These software systems are often unreliable or worse, unpredictable, given today's state of the art, but they hold out the potential of great reward to effective users. It is not a coincidence that Nabseth and Ray (1974) picked numerical control (NC) technology as an example of a significant process technology. NC is the forerunner of flexible and integrated manufacturing, which was the focus of the present research. There is a growing body of evidence from case studies and survey research suggesting that radical process change in durable goods manufacturing does not lead to automatic success for adopting units and that there is considerable variance in the performance outcomes resulting from the use of various computer-aided technologies (e.g., Davis, 1986).

Literature has appeared recently that has relevance to furthering the understanding of these new process innovations. Process innovation is defined generally as changes in throughput technology for an organization or operating unit, such as a plant, that are new to an industry (Bigoness & Perreault, 1981). But software systems are unique. For example, Milgrom and Roberts presented a detailed economic theory for computer-integrated manufacturing supporting the idea of a "modern manufacturing strategic cluster" (1990: 527) that simultaneously emphasizes marketing (for instance, lower prices with higher quality), production, technology (like flexible manufacturing), and integration of product and process engineering functions. This theory and the dimensions it includes raise the issue of how companies will use organizational integration to coordinate these functions and this array of information. More specifically, what is the nature of the multiple coupling arrangements needed to capture the benefits of adopting software-intensive process innovation?

THEORIES OF INTEGRATION

Follett said that there are three ways of settling differences in organizations: domination, compromise, and integration. Integration "involves invention, the finding of the third way" (Follett, 1933: 66), the clever way. She defined integration as a system of cross-functioning and a sense of collective responsibility. An example was to "find a design which will satisfy both the engineers' requirements and customers' demand. Neither must be given up, they must find a third way" (1933: 74). Barnard wrote that the purpose of organization was to create an impersonal system of coordination of human effort and that the most universal form of cooperation was speech and communication (1938: 94–95, 48). Thompson added that both the natural system and rational models of organization assumed interdependence between parts (1967: 54). Thompson believed that appropriate matching of technologies and structure was one way that organizations achieve "bounded rationality." Since the late 1960s and the publication of Thompson's book, considerable debate, study, theorizing, and empirical research have appeared that investigate these postulates. We review the work from this literature that seems most relevant to organizational integration and the process of technological change in organizations.

For the purposes of this review, we have summarized the literature on organizational integration and closely related issues into four broad areas: (Table 1) (1) contingency models of integration, (2) interdependency of subunits in organizations, (3) interfirm and interindustry connections, and (4) technology as an occasion for structuring and as an alternative to the technological and organizational imperatives. Although these categories are not arbitrary, many writers have discussed and investigated more than one of these topics at a time.

Contingency models are probably the most well known of the theories of organizational integration. For the purposes of this review, the term integration encompasses cooperation and coordination. We define coupling separately below.

Lawrence and Lorsch (1967) found that both differentiation and integration between departments were needed for organizations to be successful in turbulent environments. A revision of this basic model supported by industry studies appeared in Lawrence and Dyer (1984), and the focus shifted to information complexity and resource scarcity. Readaptation of organizations in changing environments requires balance in human resource

TABLE 1
Summary of Research on Organizational Integration

Issue	References	Theses and Empirical Findings
1. Contingency models of integration	Lawrence & Lorsch (1967) Lawrence & Dyer (1984) Scott (1990)	Organizational differentiation and integration needed in turbulent environments Readaption focuses on information complexity and resource scarcity Contingency model consistently supported, especially for subunits
2. Interdependency of subunits	Astley & Zajac (1990) Tjosvold (1990) Nemetz & Fry (1988) Kotha & Orne (1989) Susman (1990) Klein (1991) Baba (1989) Gerwin (1988) Collins et al. (1988) Souder & Padmanabhan (1989) Souder (1987) Gupta et al. (1987) Carroad & Carroad (1982) Hull & Azumi (1989)	Power relationships dependent on work flow; goal interdependence and interaction affect implementation of innovation Flexibility of operations requires frequent schedule changes, high interdependence Just-in-time inventory systems, new technology, and standardization decrease individual autonomy but increase group autonomy Product and process innovation become prevalent in all industries, but barriers to R&D–production coordination are substantial R&D–marketing coordination and R&D multifunctional teamwork appear to be essential to successful innovating
3. Interfirm and interindustry connections	Clelland and Finkelstein (1990) Granovetter (1985) Osborn and Baughn (1990)	Interdependence of organizations in different economic sectors sets the stage for effective innovation strategy Economic action is embedded in social structure—alternative to vertical integration and a transaction cost perspective Form of interorganizational governance depends on R&D, technological intensity, and size of parent firms
4. Technological innovation occasions structuring with different outcomes	Marcus (1988) Ginsberg & Buchholtz (1990) Gerwin (1981) Van De Ven et al. (1976) Weick (1976) Orton & Weick (1990) Markus & Robey (1988) Barley (1986) McCann & Galbraith (1981)	Response to regulated change indicates that managers do have discretion to restructure, for nonroutine technologies Overlap of subsystems is likely as an alternative to hierarchical coordination Loose coupling in school systems reinterpreted in a dialectical model of coupling Evidence that information technology is an occasion for restructuring Multiple, complementary strategies for interdepartmental coordination evident

policies, vertical and horizontal hierarchy, and new strategies. Consistent with this finding was Scott's (1990) conclusion that with high technical interdependence, more resources are needed for departmental coordination especially.

This idea leads directly to the second category of research summarized in Table 1, which concerns the interdependency of subunits in organizations; what causes it and how to manage it and its consequences are among the themes of this work. Astley and Zajac (1990) found interdependencies to be an important source of power, regardless of the measure used to assess them. Empirical results have failed to support resource dependency and exchange theories. Tjosvold (1990) studied laser-scanning technology and found cooperative goals induced interaction among employees, which promoted problem solving through expectations about work. Nemetz and Fry (1988) and Kotha and Orne (1989) concluded in two independent literature reviews that flexibility of operations required high functional interdependence, partly because of the frequency of schedule changes and flexibility mandates. Other causes of increased interconnectedness were inventory levels between production stages and the technology of each stage. Susman (1990), reviewing the literature, and Klein (1991), conducting three case studies of large firms, reached similar conclusions, replicating the findings reported in Ettlie (1988). Gerwin (1988), Collins, Hage and Hull (1988), and Baba (1989) all found that there is an increasing tendency for manufacturing firms to introduce new products and new processes simultaneously. However, when skill levels are not adequate, start-up is particularly problematic (Souder & Padmanabhan, 1989).

In addition to work on the R&D–production interface, Souder (1987) did considerable work on the R&D–marketing interface. Interdepartmental conflict is considered a typical barrier to innovation, and differences in time horizons, absence of depth of communication, and infrequency of contact between marketing and R&D are typical of these general problems (cf. Roussel et al., 1991). These findings and arguments are consistent with the observations in earlier work by Carroad and Carroad (1982), subsequent empirical findings on the R&D–marketing interface by Gupta, Raj, and Wilemon (1987), and the finding that R&D laboratory teamwork in Japan tends to be at a higher level than it is in the United States (Hull & Azumi, 1989).

The third category of research summarized in Table 1 focuses on interfirm and interindustry connections. Clelland and Finkelstein (1990) extended earlier work to show how the interdependence of certain types of organizations in different economic sectors (e.g., new equipment suppliers and manufacturers) sets the stage for effective innovation strategies. Granovetter (1985) reviewed the literature and concluded that economic action is embedded in social structure and that this perspective represents an alternative to both the vertical integration and transaction cost perspectives, especially for smaller firms. Finally, Osborn and Baughn (1990) used data on U.S.–Japanese joint ventures and found that the form interorganizational governance takes in international alliances depends upon intentions to conduct R&D, technological intensity, and the sizes of parent companies.

The fourth and final category in Table 1 concerns technological innovation as an occasion for structuring. Marcus (1988) found that plant managers exercise discretion but are subject to performance history in responding to regulated change. Ginsberg and Buchholtz (1990) obtained similar results studying health maintenance organizations (HMOs) and the timing of responses to regulated change. Much of this work has been based on or stimulated by Woodward's (1965) findings on technology and organizational structure. Gerwin (1981) concluded that for nonroutine technologies, much overlapping of subsystems is likely, and forms of coordination other than hierarchical ones are likely to emerge. Van de Ven, Delberg, and Koening's (1976) seminal work found that coordinating mechanisms varied by task uncertainty, work flow interdependence, and work unit size.

Weick (1976) found loose coupling in a school system, and Orton and Weick (1990) reinterpreted those and other findings in a dialectical model of coupling. This dialectical model defined coupling in two dimensions: responsiveness (independence-dependence) and distinctiveness (determinate-indeterminate). If a system has neither quality, it is not really a system and is noncoupled. A system that is responsive but not distinct is defined as tightly coupled. If it is distinct and not responsive, it is decoupled. If a system is distinct and responsive, it is loosely coupled. An alternative perspective, not favored by Orton and Weick (1990), is the undimensional perspective, in which loose and tight coupling are the end points of a scale.

Markus and Robey (1988) hypothesized that neither the technological imperative (new information technology determining or constraining organizational behavior) nor the organizational imperative (human actors designing systems to satisfy organizational goals) is consistent with the evidence. Rather, technology is an occasion for structuring, and the actual outcomes depend on a hybrid model. They cited Barley's (1986) findings for two CT (computed tomography) scanner implementations to support this view. McCann and Galbraith (1981) reached a similar conclusion for multiple, complementary strategies of interdepartmental coordination. Orton and Weick (1990: 219) challenged researchers to determine what organizational domains are loosely coupled, tightly coupled, decoupled, and uncoupled, as well as the characteristics of couplings. The purpose of the present study was to answer one of those questions. Specifically, what is the nature of the multiple, loose coupling rearrangements needed to capture the benefits of adopting process innovation?

SUCCESS FROM INNOVATING

Teece presented a model for capturing value from technological innovation in new products. He used the term "regime of appropriability," which "refers to aspects of the commercial environment, excluding firm and market structure, that govern an innovator's ability to capture the rents associated with innovation" (1988: 48). The most important dimensions of these regimes are the technology and the efficiency of such legal mechanisms for protecting innovation as patents; but patents and trade secrets often do not afford significant protection to product innovations. These are alternative methods (regime) to capture (appropriate) benefits from innovating. Also related to this model is Mansfield's (1988) investigation of R&D productivity in Japanese and American firms and the exploiting of internally and externally developed technologies. The United States is slightly better at carrying out innovations based on internal technology value, and Japan has the edge on external technology; this finding suggests differences in methods of integration. Teece suggested that vertical integration is the best for solving the problem of exploiting external technologies because contracts are difficult to enforce (1988: 53). Japanese manufacturing firms, like Honda, have indeed often selected vertical integration.

Further, Porter (1985) introduced a model of the value-added chain and competitive advantage. This model can be used to order integrating mechanisms and their connection to capture value from innovating. This approach is consistent with Milgrom and Roberts's theory of the "modern manufacturing strategic cluster" (1990: 527) of marketing, production, technology, and integration of product and process engineering functions. The emergence of multivariate theories of this type in the economics literature is no accident (e.g., Freeman, 1982), even though there may be limits on how these theories should be applied. We linked the concepts of the value-added chain and strategic manufacturing to organizational adaptation in a model of the process firms use to initiate or sustain successful innovating.

ORGANIZATIONAL INTEGRATION AND PROCESS INNOVATION

In this study, we proposed that the capture of value from, or successful adoption of, process innovation by an organization follows a general pattern similar to that followed by an organization attempting to capture benefit from new product or service commercialization: adopting process innovation requires simultaneous use of external and internal integrating mechanisms to be successful. What is more, as in new product innovation, most of these situations are governed by a weak appropriability regime in which the technology is difficult to protect because most new technologies embodied in the current generation of production processes are both software- and hardware-intensive and come to installing organizations from independently owned technology suppliers. These technologies are relatively easy to imitate or even circumvent with alternative innovations. Therefore, organizations have to compensate uniquely to be successful in their environments. Cohen and Zysman (1987) argued that the way to compensate is to create substantial and unique loose coupling arrangements that are the outcome of both internal and external change processes.

The next task in constructing our model was specifying the internal and external organizational integrating mechanisms that serve as an alternative to vertical integration (Abernathy, 1976; Abernathy & Townsend, 1974; Argote, Beckman, & Epple, 1990; Daft, 1978). Taking this path began to answer the specific questions raised by the dialectical interpretation of coupling in organizations. For instance, Orton and Weick asked "What elements are loosely coupled?" and "What domains are they coupled on?" (1990: 219). Since the specific integrating mechanisms in use are likely to change over time and throughout an organization's life cycle, it is reasonable to begin by specifying the types of mechanisms that are needed within the two broad categories of the market and the value-added chain (Porter, 1985).

Market-Directed Integration

One way to start specifying mechanisms for organizational integration is to take the approach of Collins and colleagues (1988), who saw uncertainty in information as guiding innovating actions. Duncan (1972) originally identified 15 sources of uncertainty in an organization's environment, including government, labor, and suppliers. But, as several authors have noted (e.g., Child, 1972) or found empirically (Ettlie, 1983), organizations typically concentrate attention on just a few of these uncertainty elements—usually customers, competitors, and technologies in the manufacturing industries. Teece built the argument that "innovators in weak appropriability regimes need to be intimately connected with the market so that designs are based on user needs" (1988: 54), since patent protection does not give them the time needed to modify designs. Both this logic and that of the organizational uncertainty approach to specification of external categories strongly suggest that the customer domain is one area in which integration is required. Von Hippel (1988) suggested that customers as well as suppliers can be a primary source of innovation ideas, whereas Van de Ven (1986) stressed the nature of transactions in the innovation process. We called such responses market- or customer-directed mechanisms; they are similar to Porter's (1985) "channel" and buyer value-added chains.

Integration Directed at the Value-Added Chain

What are the high-priority categories for internal, or value-added, integration? The data and arguments in Collins and colleagues (1988) and Gerwin (1988) on the increasing tendency for firms to initiate product-process innovation, and the increasing difficulty of their doing so (Souder & Padmanabhan, 1989), suggest that design-manufacturing functional integration will be paramount to the capture of value via process innovation. In order to achieve both technical success and economic (cost) success, new processing systems depend greatly on these two functions working in concert with technology vendors. For product innovation, a good case has already been made for close integration of marketing and R&D (design) (Mansfield & Wagner, 1975; Roussel et al., 1991). What is more, Teece's (1988) model for product innovation includes this R&D–marketing mechanism. By the same token, integration of design and manufacturing is also an important category for process innovation.

The second type of value-added integration is structural hierarchy change, which we call hierarchical integration. The reason for this choice is the importance of organizational structure in the adaptation and initiation of innovation (Cameron, Sutton, & Whetten, 1988; Collins et al., 1988; Damanpour, 1991; Hannan & Freeman, 1984; Nord & Tucker, 1987; Zaltman, Duncan, & Holbek, 1973). Another choice here could easily have been organizational strategic policies (discussed later in this article), but it is the manifestation of these strategies that researchers are really after when they concentrate on categories of integration. In particular, a pervasive issue is the way organizations solve the problem of changes in both internal and external domains by using organizational structure (Hannan & Freeman, 1984: 54; Nord & Tucker, 1987: 23; Porter, 1985). In general, we propose that a hierarchy will operate more efficiently than formerly as a coordinating device for position relationships, with a high degree of power sharing between levels (Walton, 1985) and coordinated decentralization (Collins et al., 1988; Dewar & Dutton, 1986; Ettlie et al., 1984; Zaltman et al., 1973). The arguments of Susman (1990) and the empirical findings of Klein (1991) support these explanations concerning autonomy. Further, decentralization mechanisms explain loose couplings and differentiate them from noncoupled, decoupled, and tightly coupled alternatives (Orton & Weick, 1990).

There is evidence that multiple integrating mechanisms are required when significant technological change is introduced to the production core of a firm. One recent empirical study supported pursuit of a careful investigation of hierarchy and design-manufacturing integrating mechanisms in unionized settings. In a study of 25 automobile component plants, Luria (1987) found that a 22 percent overall real cost reduction was possible if plants focused on just two areas of action intervention: the intersection of simultaneous changes in product and process technology and the intersection of process technology and changes in work organization. Changes in organizational structure or process technology alone did not yield any significant cost reductions in these plants. This and other evidence (Gerwin, 1981) suggests that the use of multiple integrating mechanisms by successful innovators may eventually explain how strong cultures can be changed to promote success (Denison, 1990).

The third and final mechanism chosen for the value-added chain as defined here is the suppliers of the components and raw materials that become inputs to a new processing technology. As Gerwin (1988) noted, the quality of inputs often determines the outcomes for computer-aided manufacturing as much as the success of a processing technology installation team. Others (Flynn & Cole, 1988; Rubenstein & Ettlie, 1979; Von Hippel, 1988) have published convincing arguments and data suggesting that suppliers are a crucial part of innovation in most organizations. Furthermore, in a review and critique of Utterback and Abernathy's (1975) model of evolution of the productive segment of a firm, Pavitt and Rothwell concluded that the framework needed to embrace a far larger number of variables than the authors used, "including the technical capabilities of suppliers and regulatory constraints" (1976: 377). In this research, we included only component suppliers for simplicity, but technology suppliers might also be important, as might also be other categories, such as government partnerships, consortia, and universities, depending upon circumstances (cf. Gray, Solomon, & Hetzner, 1986). Porter (1985: 34) grouped supplier and business unit together as upstream value chain categories. The three integration mechanisms introduced here are comparable to Porter's value-added chain sequence. This approach to value capture may be especially valid for new, programmable manufacturing technology (Goodman & Sproull, 1990).

In summary, we identified two categories of organizational integration consistent with Teece's (1988) and Porter's (1985) market-directed and value-added–directed models. We assumed that organizations need (1) to integrate externally with customers and also (2) to integrate the two functions of design (R&D) and manufacturing, (3) to link with suppliers, and (4) to integrate their organizational structure hierarchies to foster the successful adoption of process innovation.

HYPOTHESES

Figure 1 presents a summary model of organizational integration and the successful adoption of process innovation. We derived the following two hypotheses from our thoughts on appropriability regimes, organizational integration, and value capture. We attempted to summarize the full range of mechanisms that organizations use to successfully adopt process innovation by way of general approaches or dimensions, but the hypotheses are not meant to be an exhaustive summary of every possible specific method used. There is no attempt to extend the model beyond adopted process innovation. Hypothesis 1 covers the first part of the model shown in Figure 1, which links internal integration and value capture at the site of a new process installation. Hypothesis 2 covers the second part of the model, linking external integration and market value capture by an innovating unit.

FIGURE 1
Successful Adoption of Process Innovation

		Organizational Integrating Mechanisms	
		Value-Added Chain	Market
Success Dimensions	Internal Capacity	Organizational structure changes through design-manufacturing coordination enhance capacity, productivity, and supplier coordination	No direct association in successful cases
	External Flexibility	No direct association in successful cases	Changes in customer relationships promote service through flexibility

> *Hypothesis 1: The use of value-added-chain integrating mechanisms promotes successful adoption of process innovation directly through productivity improvement, which enhances throughput capacity.*
>
> *Hypothesis 2: The use of market-directed integrating mechanisms promotes successful adoption of process innovation through enhanced flexibility and service to customers.*

In this study, we considered the value-added integrating mechanisms to be changes in the structural hierarchy of a unit, enhanced integration of design (R&D) and manufacturing functions, and supplier integration. The market-integrating mechanisms considered here encompass methods for enhancing loose coupling with customers. We could also have evaluated other examples, but we assumed that the mechanisms outlined above covered many of the manufacturing priorities for strategic value capture through their effects on uncertainty reduction and control.

In essence, Figure 1 summarizes a model combining Hypotheses 1 and 2. That is, significant zero-order correlations in the expected directions should be evident in just the upper left- and lower right-hand quadrants of the model. A correlation matrix can be constructed to test this model, and it is presented later. The other part of the model is equally important, because it predicts that there will be no significant correlations in the upper right-hand and lower left-hand quadrants. This general model, which could be tested in other settings with other measures, served as the general thesis of this research.

The mechanisms underlying our propositions seemed quite straightforward and grounded in the literature. First, we assumed that backward integration (e.g., ownership) is not a viable alternative method for capturing the benefits of process innovation because suppliers of materials and components in manufacturing are not likely to be available for purchase and are far too varied to permit a cohesive ownership strategy. The integrating mechanisms we have described should be much more attractive (e.g., Markus & Robey, 1988).

Therefore, other integrating mechanisms are needed, not only to pressure suppliers to satisfy customers, but also to coordinate the work of organization members with the activities of the new enterprise created through radical process innovations. We expected that organizational integrating mechanisms targeted at two dimensions, the value-added chain and customers, would influence a large number of organizational effectiveness measures and transcend the unique technological characteristics of any particular process innovation being installed. That is, loose coupling specifications would vary by economic sector but were likely to be consistently more advantageous than other alternatives (Orton & Weick, 1990).

Concerning the need for integration in the value-added chain, current organizational needs for strong coordination will tend to focus efforts on minimizing goal conflict, adopting new procedures, and building common languages (Barnard, 1938) and norms. The high uncertainty caused by this new generation of integrated production technologies accounts for this focus. First-generation technology deployment strategies that relied on group ownership and islands of new technology, such as automated design (computer-aided design) and manufacturing (numerical or computer-numerical control), are strategies that integrated-flexible manufacturing may render obsolete. The new generation of technologies for production is designed to function optimally when firms employ integrated data bases or distributed, shared data bases. Since not all information can be integrated with computer technology, a new mix of human and computer integration is needed. Functional and hierarchical isolation will simply not work under these circumstances.

METHODS

The data for this study were generated from a cross-sectional panel of firms and interviews with project personnel in modernizing plants during 1987. We defined the population for the study as all domestic plants undergoing significant modernization of manufacturing processes during our sampling time frame (1983–87). All firms, plants, and individuals were guaranteed anonymity.

Data

The study group was compiled by merging lists of announcements posted in major industry periodicals of purchases of significant, multiple component, flexible manufacturing and assembly systems. We screened trade publications such as *Automation News* and *Metalworking News*, all the major robotics publications, and *American Machinist* for announcements of system purchases. We expected at least a 50 percent response rate, so, taking into account the budget for the project, we worked until we had a list of about 80 cases. A target group of approximately 40 plants in Standard Industrial Classification (SIC) codes 34–37 was assumed to be adequate on the basis of effect size for this type of study (Cohen, 1977).

To be eligible for the study, a firm had to have committed resources for the purchase of a system but did not have to have installed it. Representatives of a total of 39 (66%) of the first 59 eligible plants we contacted agreed to participate in the study for the first panel data collection. We evaluated nonresponse bias. Comparing responding and nonresponding firms on size (number of employees) yielded no significant difference ($t = 1.7$, n.s.). We also compared responding and nonresponding firms by distribution of cases by SIC code. Most firms fell within the major manufacturing groups 34–37. Of respondents, 13.9 percent fell in SIC 34 (fabricated metal products like hand tools), and nonrespondents had 10.5 percent in this category; for SIC 35 (machinery, except electrical), 38.9 percent of respondents and 36.8 percent of nonrespondents had this as their primary code. For SIC 36 (electrical equipment), respondents had 11 percent and nonrespondents 5.2 percent. Finally, 11 percent of respondents fell in SIC 37 (transportation equipment), and 10.5 percent of nonrespondents. Sources of data for these comparisons included Dun & Bradstreet's *Million Dollar Directory* and Standard & Poor's *A Register of Corporations*. The other four tests are discussed below. Further, we found no significant industry effects in a one-way analysis of variance (ANOVA) grouping cases by SIC code (see Table 2).

The 39 plants represented all regions of the United States. The plants purchased either flexible manufacturing systems, defined here in very broad terms to include multiple machine, computer-integrated, materials-handling intensive, discrete parts production (20 plants, or 51 percent), or flexible assembly systems (19, or 49%). The median new system cost was $3.6 million, but 10 (26%) of the plants initially spent less than $1 million on hardware and software.

TABLE 2
Results of ANOVAs for Industry Effects

Performance Measures	*F*	*p*	Means	*n* per industry
Throughput time reduction	0.32	n.s.		3–11
SIC 34			73%	
SIC 35			48	
SIC 36			58	
SIC 37			58	
Cycle time achieved	2.40	.09		4–11
SIC 34			77%	
SIC 35			98	
SIC 36			120	
SIC 37			96	
Two-shift utilization	0.82	n.s.		3–14
SIC 34			72%	
SIC 35			70	
SIC 36			87	
SIC 37			70	
Scrap and rework	1.40	n.s.		2–11
SIC 34			5.5%	
SIC 35			2.2	
SIC 36			1.5	
SIC 37			2.0	
Changeover time	1.10	n.s.		3–8
SIC 34			2.10 hrs.	
SIC 35			1.20	
SIC 36			25.00	
SIC 37			.08	
Part families	1.30	n.s.		3–9
SIC 34			3.0 p.f.	
SIC 35			4.3	
SIC 36			15.3	
SIC 37			178.0	

Participating plants were primarily operated by large companies, with the vast majority of firms (34, or 87%) having more than 500 employees. The plants studied also tended to be large, with about 60 percent having more than 500 employees on site. The smallest plant had 12 people, the largest, 12,000, and the median, 850.

Respondents

Over 100 employees were interviewed in the plants selected for the study. We identified one primary respondent in each case, although we usually interviewed two or three people at each plant. Top managers were typically the primary respondents (N = 20), but some middle managers (N = 10) also performed this role. Combined, top and middle managers accounted for 30 (76.9%) of the primary information providers. The remaining 23 percent of primary respondents were engineering, project, or program managers.

Other respondents were used primarily to supply information not available from the primary respondents. For example, when production data were not available in an office, another person who had access to records supplied it. We simply eliminated obvious inconsistencies in the disparate responses that could not be resolved. If there were minor disagreements, we used the response of the most knowledgeable respondent—usually, but not always, the manager. But response inconsistencies rarely occurred in this on-site, intensive investigation of very visible projects for installing new operating technologies. It could clearly be seen whether production was or was not running. Supplied parts were delivered or stored, or they were not. This research approach is very unlike one using mailed or telephone interviews or questionnaires, in which respondent answers cannot be verified by plant tours, production personnel, and actual examination of system outputs. We were asking "experts" to report on actual, verifiable actions and performance outcomes (e.g., Dewar & Dutton, 1986). On the other hand, the cost of this type of research restricts the number of cases that can be studied microscopically in order to collect verifiable data and information that is quantitative as well as qualitative.

Integration Measures

We used extensive preliminary data collection on both the technology suppliers and on firms that have used robots and flexible manufacturing and a review of managerial practice and technology adoption trends in the durable goods industries covered in this study (Ettlie, 1988) to produce candidate items for measuring the four dimensions of integration. The value-added chain dimensions were hierarchical integration, or the degree of power sharing and vertical coordination in an organizational structure; design-manufacturing integration; and supplier integration. One market dimension was also developed to examine customer integration. The interview schedule included all questions and information items used for constructing measures of these dimensions. A total of 100 items formed the initial item pool, 28 for hierarchy, 35 for design-manufacturing, 24 for suppliers, and 13 for customers. However, with the exception of the last category, we eliminated items with extensive missing data (one-third or more) from the reliability analysis produced with the SPSSx statistical analysis package. This criterion for missing data restricted the item pool greatly, especially for the design-manufacturing and hierarchy integration scales. There were usually at least twice as many candidate items as were ultimately employed for all four dimensions.

Our general approach to developing scales was to question only behaviors, practices, and actions that could be verified on plant tours. Therefore, the possible responses were generally limited to "yes" (the action had been accomplished), "no," and "in process." When "in process" was the response, we asked a follow-up question to learn how plans were proceeding. We assigned these responses code values of 3, 1, and 2 for yes, no, and in process, respectively. In all cases, and again for each section of the interview schedule, we reminded respondents that the practices identified had to be specifically tied to just the modernization program and system under study. In many cases, we asked respondents to give examples of a practice in order for an answer to be qualified as a yes response. Just having a quality circle program or just-in-time delivery from suppliers in a plant was not sufficient, for instance. These actions had to be part of the modernization effort of interest.

Under normal circumstances, a researcher would want more than three response categories (Van de Ven & Ferry, 1980: 64). However, we limited our response categories for two reasons. First, since there were more than 25 questions for each respondent to answer concerning behaviors and actions, not attitudes, it was easier to administer the interview schedule using this approach, as we discovered during pilot-testing of the interview. Second, since item clustering was our aim, not refined calibration of previously developed measures of integration constructs, the use of dichotomous or limited category response formats was justified (Kim & Mueller, 1978: 75). On the other hand, variance is lower on these scales than it is for the measures typically used for assessing attitudes.

A number of ideas for items on the interview schedule for assessing *hierarchical integration* came from Walton (1985). We employed item clustering and correlation measures to produce a hierarchical integration scale containing four items, with a Cronbach alpha of .66, an average interitem correlation of .32 ($n = 30$), and a scale mean of 9.2 (s.d. = 2.46). The n's vary throughout because of missing data on individual items.

The hierarchical integration items were as follows; corrected item-total correlations are in parentheses: (1) "Our adoption of advanced manufacturing technology has had a definitive impact on our business unit or functional strategies (e.g., clauses in rolling 5-year plan have changed)" (.54), (2) "We have implemented technology agreements with the labor force specifically in conjunction with the new technology purchase" (.52), (3) "In a downturn, there is equality of sacrifice among employee groups (layoffs of blue and white collar)" (.42), and (4) "We share business data directly with blue collar employees in meetings and memos" (.28). The action on this list most rarely reported was the technology agreement, with 14 (36%) of the cases reporting details of their affirmative answer. Again, recall that innovative union contracts and agreements were not the issue here, but rather contracts that incorporated a novel means of technology introduction. Research has discovered such contracts in situations quite different from those in this study (Walton, 1985), which increases our confidence in the usefulness of assessing their presence.

The scale to measure *design-manufacturing integration* consisted of five items (α = .73) with an average interitem correlation of .36 (n = 27) and a scale mean of 9.15 (s.d. = 2.92). The items and item-total correlations were: (1) "We have people who are trained in DFA (Design for Assembly) or DFM (Design for Manufacturing). (IF YES) Who was trained for what?" (.48); (2) "A manufacturing representative is required to sign-off on design reviews for new products on this system" (.45); (3) "We have developed and implemented new structures in order to coordinate design and manufacturing. (IF YES) What are these structures?" (.66); (4) "Job rotation between design and manufacturing engineering is practiced in this firm" (.48); and (5) "Personnel from design engineering are sometimes moved to manufacturing or vice-versa" (.45).

On the basis of the interviews, the rarest modernization-related behaviors were job rotation between design and manufacturing engineering, reported by respondents from only three (7.7%) of the plants, and the use of training in DFA or DFM, reported by respondents from only six (15.4%) of the plants. Permanent movement of engineers between design and manufacturing was apparently a more common practice, although still relatively rare, with 13 respondents representing 33 percent of the plants reporting the practice. Typical examples are two cases of senior manufacturing engineers in automotive plants being transferred to product teams. These first two scales to emerge are essentially the same as the measures Luria (1987) reported, which greatly enhanced our confidence in the validity of these indicators.

Development of a scale to measure *integration with component and material suppliers* resulted in seven items. The Cronbach alpha for the scale is .85, the average interitem correlation is .45 (n = 20), and the mean is 14.6 (s.d. = 4.86). The items included in the scale and item-total correlations were: (1) "We introduced procedures for JIT (just-in-time) purchasing or delivery" (.70); (2) "We introduced new purchasing policies. (IF YES) Explain" (.42); (3) "We buy integrated components from suppliers" (.60); (4) "We established programs to educate suppliers in areas such as statistical process control (SPC)" (.63); (5) "We have established a contingency supply policy—for example, backup sources have been identified" (.60); (6) "We have reduced our inspection of incoming parts" (.57); and (7) "We use supplier award programs" (.52). The rarest affirmative response, which occurred in 11 (28.2%) of the cases, was to the third item, concerning purchasing of integrated components.

Some normative data on the fourth item of this scale are available in Flynn and Cole (1988). They asked 15 automotive suppliers whether they had done anything to assist their suppliers in improving quality and productivity, and 80 percent said they had. Of the 39 plants we studied, 19 (48.7%) had respondents who gave affirmative answers to the fourth question, which generally supports the notion that educational programs for suppliers are in common use. Overall, these results provide support for the validity of the supplier scale.

The market integration construct focused on customers, and one viable scale emerged. We developed this scale, *customer alliance*, from 13 questions in the customer section of the interview. The final eight items and item-total correlations were: (1) "We have developed new contracts with customers" (.50); (2) "We have changed net payment periods or terms for financial transactions with customers (IF YES, explain)" (.32), (3) "We have changed warranty agreements with customers (IF YES, explain)" (.35), (4) "We include customers in decisions that concern product development and manufacturing utilizing this (new) system" (.53), (5) "We have initiated joint ventures with customers (IF YES, explain)" (.32), (6) "We share the technology for our new system with key customers (IF YES, explain)" (.69), (7) "We have changed product standards with the use of this system to benefit customers" (.53), and (8) "We have reduced the number of paper forms that are used for business transactions with customers" (.53) (Starik, 1990). The mean of this scale ($n = 22$) is 13.77 (s.d. = 4.59), the alpha is .79, and the average interitem correlation is .30.[1]

Dependent Variables

A total of seven performance measures were included in the data collection instrument developed for the plant visits and the analysis reported here. To test the two hypotheses, we organized the seven performance measures into two categories. First, contribution to manufacturing process capacity was assessed using system performance measures: scrap and rework rates, cycle time achieved, utilization, and throughput time reduction. Second, we measured flexibility, in terms of changeover time, the number of part families scheduled on a system, and reduction in service calls to customers. Data were collected, with respondent assistance, from production records, technical design specifications, technology supplier blueprint proposals, and other, similar sources. We used archival sources extensively to validate respondents' estimates. Most respondents indicated that the number-one show-stopping problem encountered during modernization was the development and maintenance of manufacturing system software. This finding supports the general conclusion of Goodman and Sproull (1990) that programmable process innovations are unique because they do not use mechanical systems alone as their model.

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[1] We developed a second five-item scale to measure customer integration using five items that appear to capture the marketing-manufacturing interface (Crittenden,1990). However, its Cronbach alpha was only .48, and reducing the scale to two questions raised the alpha to just .54. The two items were "changed standards for EDI (Electronic Data Interchange) with customers" and "encourage customers to introduce new products to exploit our technology." Apparently this scale was limited by the absence of "in process" options selected by respondents in three of the five items. This scale has potential merit for future research but was not pursued with the data in this study.

The three system performance measures were defined as follows. First, we learned the percentage of target cycle time actually achieved, obtaining an average of 94 percent. This measure is equivalent to the ratio of actual cycle time in average net parts per hour, divided by target cycle time in net parts per hour. Second, we asked respondents to show us production records indicating two-shift utilization time (time actually producing parts, under automated cycle control), on a two-shift (16-hour) basis; the average was 72.3 percent. Third, the measure of throughput time reduction is a percentage based on comparisons of throughput time intervals before and after a system was installed; the average was 54 percent. Empirical evidence provides some support for the validity of these measures.[2,3] We also obtained data on scrap and rework rates as percentages of total manufacturing costs for the systems (the average was 2.91 percent) and the plants (average, 4.26 percent).

The flexibility measure was the average time required to change a system over to produce new parts, new part families, or new models. The 19 complete data cases averaged 6.25 hours (s.d. = 22.75 hours). A second measure recorded the number of part families manufactured with a new system (average = 40.35, s.d. = 155.45).[4] We validated these data by examining parts actually being produced in the shops. Finally, the measure of reduction in service and warranty costs was coded 1 for "yes" and 0 for

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[2] During firm selection and data collection, a widespread legal challenge to a patent on flexible manufacturing systems was pending; many firm representatives reported that this issue influenced their decision to continue participation. Firms' lawyers feared data collected might be "discovered" and introduced as evidence in court. There was no apparent relationship between the performance of these systems and attrition or participation in the project. We had a total of 7 of 34 (21%) complete data cases reporting 60 percent or less utilization (the average was 72.3 percent), so we apparently did not eliminate failures or marginal success from the data.

[3] Validation of two of these scales, cycle time and utilization, was accomplished by correlating case scores, where available, with evaluations from an industry expert and consultant on FMS. In a blind test, this independent judge assigned ratings of 1 (failure), 2 (poor), 3 (average), 4 (good), and 5 (excellent) to nine cases on which we had production data from plant visits. The resulting Kendall correlations were tau = .53 ($p < .06$) for cycle time and tau = .45 ($p < .08$) for utilization. This is a relatively good initial indication of adequate construct validity for variables relying on two independent bases of inference (Campbell & Fiske, 1959).

[4] The large standard deviation of these flexibility measures is due to their skewed distribution. Median scores may be more representative. For changeover time, the median was 0.45 hours, and for part families, it was 3.5.

"no"; the latter response was based on warranty cost estimates, service reports filed from the field, and postings of warranty problems, as available. Although we avoided common method bias between independent and dependent variables by using several sources, doing so also generated missing data. Generally, respondents cannot guess utilization performance since a computer typically reports (or does not report) these data each hour and downtime is easily observed, even by a casual visitor touring plants.

We performed four additional checks for response bias. The dependent variables were evaluated for restricted range. For example, throughput time reduction ranged from 0 to 200 percent. Utilization ranged from 30 to 96 percent. No restriction of range was detected in any of the seven dependent variables. We controlled all significant correlations between the integration dimension measures and performance outcomes (Table 3) for firm size and found no effects. We conducted regression analyses for all significant independent (integration measures) and dependent (performance outcomes) variables, comparing pairwise deletion of missing data correlations (Table 3) with correlations obtained by substituting the mean for missing data. For the five significant entries, only one changed from significant to nonsignificant using the mean substitution method. Finally, we checked the pattern of case-by-case reporting of the seven performance measures by having two independent judges familiar with the area but not directly involved in the study look at the archival ratings by case and variable list. Randomness cannot be checked directly because ratings from records are not necessarily reported in the same order in the field each time. Respondents often have to look up performance records. Neither judge could detect a pattern in reporting by variable included. On the basis of these tests, we concluded that there was no evidence of response bias in the data.

We tested the independence of the four firms with two or more plants in the study group to see if they reported significantly different observations. All plants were located in different divisions. ANOVAs indicated that for each major scaled variable, no comparison was significant. We concluded that the firms studied were reasonably representative of the population of domestic modernizing plants. Major variable correlations of unionization and nonunionization and government contract and nongovernment indicators were also nonsignificant. The one exception was that large firms were more likely to be unionized than smaller firms.

RESULTS

Organizational Integration

Table 3 is the complete correlation matrix. Integrating mechanisms and performance measures were generally not significantly intercorrelated. Exceptions were the correlations of the hierarchical and design-manufacturing integration scales with the customer alliance scale. With one exception, the

TABLE 3
Correlation Matrix[a]

Variables	Means	s.d.	*n*	1	2	3	4	5	6	7	8	9	10
1. Hierarchy	9.20	2.46	30										
2. Design-manufacturing	9.15	2.92	27	.15 (21)									
3. Supplier	14.60	4.86	20	.13 (17)	.26 (17)								
4. Customer alliance	13.77	4.59	22	.66 (19)**	.49 (16)*	.29 (16)							
5. Throughput time reduction	.54	.41	24	.47 (20)*	.20 (15)	−.37 (12)	.30 (14)						
6. Cycle time achieved	.94	.31	32	−.26 (23)	.22 (23)	.54 (16)*	.02 (18)	−.26 (22)					
7. Two-shift utilization	.72	.17	34	.14 (25)	.42 (25)*	−.39 (17)	.37 (20)	.07 (22)	.05 (30)				
8. Scrap and rework	.03	.04	27	.02 (21)	−.13 (20)	−.54 (13)*	.22 (17)	−.03 (20)	−.15 (26)	.06 (25)			
9. Change-over time[b]	6.25	22.75	19	.10 (15)	.36 (17)	.50 (11)	−.02 (12)	.30 (12)	.92 (16)**	.34 (18)	−.22 (14)		
10. Part families	40.35	155.45	30	.27 (18)	.02 (15)	−.07 (10)	.48 (14)*	.05 (13)	.12 (16)	.21 (19)	.10 (15)	−.20 (14)	
11. Reduced service, warranties	.59	.50	22	.25 (16)	.02 (18)	−.13 (9)	.04 (12)	−.26 (14)	−.11 (19)	−.17 (22)	.27 (18)	−.42 (13)	.20 (13)

[a] Coefficients entered with complete data pair observations; number of observations in parentheses.

[b] In hours.

* $p < .05$

** $p < .01$

dependent variable measures were also not significantly intercorrelated.[5] Therefore, we present a simple, abbreviated correlation matrix (Table 4) as evidence of the tests of predictions.

Hypothesis 1 states that an organization's integrating efforts using changes in hierarchy, design-manufacturing coordination, and supplier relationships will most likely lead directly to the capture of benefits from productivity and capacity enhancement. We used four performance measures to evaluate this proposition: cycle time, utilization, throughput time reduction, and scrap and rework rates. Hierarchical integration is significantly correlated with percent throughput reduction ($r = .47$, $p = .017$, $n = 20$). Design-manufacturing integration is significantly correlated with new system utilization ($r = .42$, $p = .018$, $n = 25$). Cycle time is significantly correlated with supplier (external) integration in the predicted direction ($r = .54$, $p = .016$, $n = 16$). Supplier integration is also significantly correlated with lower scrap and rework percentages ($r = -.54$, $p = .029$, $n = 13$). There are no statistically significant correlations between these three value-added-chain integrating mechanisms and market outcomes (Table 4). This correlation pattern generally supports Hypothesis 1.

Hypothesis 2 states that market-directed organizational integration will most likely lead directly to the capture of value from process innovation by enhancing manufacturing flexibility and decreasing service requirements. The customer alliance scale is significantly correlated with the number of part families scheduled on a new system ($r = .48$, $p = .04$, $n = 14$) but not significantly correlated with changeover time or service reduction requirements. Customer alliance is not correlated significantly with any of the internal capacity measures of performance. Therefore, findings support Hypothesis 2 for flexibility in part families only.

The general model presented in Figure 1 was tested using the sign test (Gibbons, 1976) and the z-statistic approximation for large samples. This general model predicts that not only will integrating mechanisms of loose coupling be related to performance outcomes, but also that there will be a pattern in these significant relationships. Taking the 28 entries in Table 4, we defined a prediction as a success (S_+ in the sign test) whenever we encountered a significant correlation coefficient in the predicted direction. A success was also tallied for all nonsignificant correlations that were consistent with the outcomes predicted in the model outlined in Figure 1. In the

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[5] Changeover time and percentage of target cycle time achieved were significantly correlated ($r = .92$, $p < .01$, $n = 19$). Therefore, it is likely that there might be crossover between the two quadrants for these performance measures and their predicted significant correlates, which might explain some of the exceptions to predictions in Table 3. For example, the supplier scale, which was significantly correlated with cycle time achieved, just failed to be significantly correlated with changeover time ($r = .50$, $n = 11$, $p = .06$), as would be expected. However, we observed no significant results of this type. Since measurement systems in manufacturing are receiving renewed attention, subsequent research needs to raise these issues. Better theory and empirical support for tiered performance measures are needed.

TABLE 4
Correlations Between Organizational Integrating Mechanisms and Performance Outcome[a]

	Dimensions of Integration[b]			
	Value-Added Chain			Market
Performance Measures[b]	Hierarchy	Design Manufacturing	Supplier	Customer Alliance
Internal: capacity				
Throughput time reduction	**.47*(.49*,.44*)** **(20)**	.20 (15)	−.37 (12)	.30 (14)
Cycle time achieved	−.26 (23)	.22 (23)	**.54*(.54*,.53*)** **(16)**	.02 (18)
Two-shift utilization	.13 (25)	**.42*(.42*,.47**)** **(25)**	−.39 (17)	.37 (20)
Scrap and rework, percent total manufacturing cost for system	.02 (21)	−.13 (20)	**−.54*(−.53*,−.55*)** **(13)**	.22 (17)
External: flexibility				
Changeover time	.10 (15)	.36 (17)	.50 (11)	−.02 (12)
Part families	.27 (18)	.02 (15)	−.07 (10)	**.48*(.60*,.47^{c})** **(14)**
Reduction in warranty and service	.25 (16)	.02 (18)	−.13 (9)	.04 (12)

[a] First-order partial correlations controlling for number of firm employees; the natural logarithm of number of firm employees are in parentheses.

[b] Dimensions of integration (with two expectations for customer alliance) and performance outcomes (with one exception each) were *not* significantly intercorrelated.

[c] $p = .055$

* $p < .05$

** $p < .01$

value-added-chain category, we expected significant correlations only between internal-capacity-enhancing performance measures and the hierarchy, design-manufacturing, and supplier integration scales. For market outcomes, we expected customer alliance to be significantly correlated with performance measures reflecting enhancements in flexibility and service cost reduction. The results show that the model correctly predicts 18 of the 28 correlations between the integration scales and dependent variables. These measures result in an observed z of 1.35 ($p = .089$), according to the method in Gibbons (1976). Although this z does not meet the traditional cutoff value for statistical significance (0.05), correct prediction of 18 of 28 entries (64%) is an important result. We consider it to indicate overall support for the general model and to suggest that the model is worthy of replication and testing in other settings.

We controlled for organization size, defined as number of firm employees and its natural logarithm, in each significant correlation coefficient and found no effect (Table 4). However, it should be recalled that most of the firms studied had more than 500 employees.

We also examined the plausible rival hypothesis that backward integration rather than organizational integration accounts for firms' attempts to capture value from process innovation; of a total of 34 complete data cases, in only 3 cases (9%) had a components, materials, or other significant supplier been purchased as part of the modernization program we studied. Our tentative conclusion is that, as predicted, backward vertical integration is not a viable alternative for value capture in the type of software-intensive process innovations represented in this study.

A complete study of firms using varying degrees of backward vertical integration would be needed to confirm this result. However, it is clear from other research that the type of loose coupling used by the companies we examined promotes the formation of strategic networks (Jarillo, 1988, 1990) by lowering transaction costs with suppliers and other constituents, like customers. Under these circumstances, vertical integration becomes a less desirable alternative than it might be otherwise. Another growing body of work suggests that firms have great difficulty realizing the projected benefits of buying an innovative supplier, or any other firm (Hoskisson & Hitt, 1990). Automobile companies appear to have learned how to manage new product-supplier relationships better in Japan than in the United States (Clark, 1989), which shows that the effectiveness and efficiency of these relationships is subject to variance. Studying 175 firms in SIC categories 35, 36, and 37, a group very similar to that in the present study, Heide and John found that supplier alliances can be used as an alternative to "global action such as vertical integration" (1990: 34) quite independent of the "nature of the manufacturing process" (1990: 33). Sharing information is the key to making these value-added partnerships work, according to Johnston and Lawrence (1988) and Lyons, Krachenberg, and Henke (1990: 34).

An emergent pattern in the results reported in Table 4 can be summarized here. Integrating mechanisms directed at the value-added chain tend to be correlated with system-level outcomes. For example, hierarchical and design-manufacturing integration appear to consistently affect throughput time and system utilization. Supplier integration promotes scrap reduction and meeting cycle time targets. Market-directed integration promotes flexibility and reduces service requirements. Taken together with the finding that only three firms used backward vertical integration to capture value from modernization programs, those results generally support Hypotheses 1 and 2 and the general model they represent (Figure 1).

Since the average correlation results roughly follow the reliability levels indicated by the Cronbach alphas, some attenuation may have occurred as a result of reliability. Validity data were unavailable on most of the performance measures (see footnote 3), so it was not possible to do a comprehensive evaluation to correct for this potential attenuation (Carmines & Zeller, 1979). However, since this pattern is only approximate, we began to speculate on why some integration mechanisms are more effective in the capture of value than others. If supplier integration and customer integration are potentially powerful predictors of performance outcomes, we need to explain why this differentiated effectiveness prevails. Two possible explanations come to mind. First, both integration mechanisms generally cover the broad spectrum often associated with the innovation process—that is, they cover activities normally associated with planning and implementation. Second, they both touch on cost categories generally proportionally greater than those in the other two types of integration. For example, Nevins and Whitney (1989) reported the cost of purchased parts and materials to be more than half of the total cost incurred in manufacturing. Therefore, suppliers are extremely important. Stoll (1986) argued that in the management of the design process, a large percentage of the costs of a new or redesigned product is actually determined long before resources are committed. Yet suppliers often influence part selection. Another possible explanation for the relative unimportance of these two integrating mechanisms is that organizational decision makers understand less about how to couple modernization programs and customer and supplier integration than they understand about the other types of integration studied, and therefore, organizations that master integration with suppliers and customers have a competitive edge over organizations that ignore those areas.

Relative Success Validation

The results for the scrap and rework percentages were obtained by comparing the average scrap and rework rates for the new manufacturing systems studied to the averages in the remainders of the plants in which the new systems were installed or the plants charged with the operation of new system installations. These results appear in Table 5.

For the new systems, the average scrap and rework rates of 2.9 percent was 32 percent better than the existing plant scrap and rework rate (4.3%), and this difference represents a significant improvement in this cost-of-quality measures (t = −2.78, p = .011). Schmenner (1989) surveyed 265 U.S. factories and found that rework percentages averaged 5.1 percent; for

TABLE 5
Scrap and Rework Comparison for Plants and New Manufacturing Systems

Variables	Means	s.d.	s.e.	Difference in Means	*t*	*df*	p^a
Percent total manufacturing cost for system	.0291	.039	.008	−.0135	−2.78	.22	.011
Percent total for plant	.0426	.031	.006				

[a] Based on a two-tailed test.

130 European factories, it averaged 4.2 percent, and for 160 Korean factories, 4.6 percent. Our measures seem to be representative. Schonberger (1982) suggested that new technology restricts the variance of production process parameters, which promotes consistent quality. On the average, then, these comparisons suggest that organizations do find ways of capturing value from process innovation.

DISCUSSION

In this study, we proposed and tested a model for the successful adoption of process innovation. Although some degree of success was obtained, the results also point to limitations in the ability of the data to validate the model. Firms integrate in novel ways in both their value-added chains and markets to increase the probability that their efforts to install new processing technologies will succeed. More specifically, a pattern of results emerged suggesting that organizational integration linked to structure and suppliers tends to be associated with enhanced productivity and capacity, and externally, market-directed organizational integrating mechanisms tend to be associated with enhanced flexibility and reduced service requirements. These results identify some significant loose coupling mechanisms for organizations operating in the economic sectors of interest here (Orton & Weick, 1990).

One interpretation of the results is that the R&D and innovation management process need not be restricted to the technological core of an organization. The capture of value from process innovation can also be managed. The introduction of new integrating mechanisms can guide and encourage systematic proposals and deployment of process innovations. One of the reasons an individual or group of actors in an organization has to orchestrate this close coupling goes to the heart of the nature of the innovation process. Organizational innovation efforts do not come about by intent alone, and the success of innovative projects cannot be guaranteed.

Our results suggest that organizational integration directed at component and material suppliers may have greater ability to capture value than other approaches. Not detected by our measures (we asked if any supplier had been acquired), but certainly another candidate for exploration, is the relationship with suppliers of core technologies. Technology suppliers introduce substantial uncertainty into the value capture of process innovations. We can imagine rather unique contracts as alternatives to backward vertical integration, and firms today are no doubt exploring such contracts (cf. Clark, 1989; Heide & John, 1990; Jarillo, 1990). This emerging trend in supplier integration is important, especially in light of our finding that the number-one show-stopping problem was seen to be manufacturing software development and maintenance. In addition, our finding confirms the uniqueness of these new process innovations in manufacturing. Organizational integration in this external, supplier dimension should be examined more extensively.

There is some weak evidence in the current findings suggesting that some integrating mechanisms counter the performance impacts of others. For example, supplier integration was significantly correlated with achieving high target-cycle-time percentages and low scrap and rework rates using new flexible automation. However, supplier integration just failed to achieve statistical significance when correlated with measures of changeover time, in an adverse direction. Suppliers do not want to hold inventories for their customers, which is often the only way to manage a just-in-time manufacturing operation. This finding has relevance for both theory and the practice of all firms modernizing their productive cores—initiatives have to be orchestrated. But it may also have implications for how various types of loose coupling in organizations act naturally to counterbalance dependency and responsiveness trends. In successful organizations, perhaps this set of checks and balances among loosely coupled parts and their environments are what create and maintain stability. These findings suggest that further refinement of this general integration theory is needed.

This issue draws attention to the most important practical implication of the current research findings. Managers may be continuously bombarded with, or propagate, "programs of the week," and employees often feel quite helpless in the face of multiple initiatives to improve quality, cost, timeliness, and image one week at a time. The results of this study provide some real direction for establishing priorities and putting the pieces of management initiatives into perspective. In the model that emerges, all initiatives have a place, and their differential impacts can be predicted to some extent. JIT purchasing and inventory management appear to have more meaning for transition management than JIT for customers. It is possible to get customers confused with transition management, but it is rarely too early to get suppliers involved. Design-manufacturing integration affects the use of new manufacturing systems, but not the cost of quality. Such guidance is rarely available to an administrator. On the other hand, our results only suggest the relationship between these special initiatives and ongoing changes. Many firms have well-advanced JIT programs and can readily hook up with new technology initiatives now. These outcomes notwithstanding, the details of how various well-intended initiatives are linked is still a matter of speculation.

Refinement of this theory and further validation are needed. Although we found that integrating mechanisms of loose coupling directed at the value-added chain were generally significantly associated with internal-capacity-related performance measures, it is not clear, for example, why particular types of coupling are associated with one or some, but not all, of these capacity measures. Results suggest that customer alliance integration is more likely to be associated with part family flexibility than with changeover flexibility or service cost reduction. Our theory does not currently explain why this occurs.

A refined theory of integration and successful process adoption would explain the details of these coupling-performance relationships. For example, it seems plausible that the reason supplier integration is related to the cost of quality is that new manufacturing systems are inherently more reliable and therefore adjustable for quality than older systems. Scrap and rework then becomes in great measure a function of the quality of incoming parts and materials. Other refinements of this type are needed.

Refinement of a theory of integration and value capture from innovating alone will not, however, overcome two of the persistent limitations of this study. First of all, our limitation to examining just three outcomes for any one policy—an action had been taken, was in the process of being taken, or had not been taken—partially offsets the advantage of focusing on actions and policies actually implemented in modernizing firms. Scales based on those responses measuring overall integrating trends have limited variance. Adding more outcomes per se is not the solution to this problem because doing so would complicate the construct and factor structure in a typical study of this type and might actually inhibit theory development. What appears to be needed is a more refined way of characterizing behaviors, actions, and the manifestation of policy implementation, three structural categories that can be measured. For example, do operators perform system maintenance, software debugging, and reprogramming? This more refined method of capturing policy implementation would also increase the practical significance of this line of research.

The second limitation of this study that needs to be addressed is the potential crossover of effects between the value-added-chain and market outcomes. Do significant relationships occur between integrating mechanisms in the value-added chain and flexibility outcomes such as the .50 correlation ($p = .06$) between supplier integration and changeover time (see Table 4)? Is there a causal hierarchy in the impacts of integrating mechanisms on the successful adoption of innovation? In the present study, we found two of the dependent variables to be significantly correlated: percentage of target cycle time achieved and changeover time. Supplier integration and cycle time achieved were also significantly correlated ($r = .54$, $p = .02$). Could this have resulted because some firms had longer part runs, smaller batch sizes, and inherently longer lead times than others? Could some plants have concentrated on changeover time or achieved target cycle times by sacrificing changeover time? Not only is a causal model of outcomes needed, but also an assumption that outcome measurements need to take into account the goals of any substantial investment in new technology. If firms and plants with clear goals achieve clarity of direction by limiting the number of measures they used, say to just productivity or quality, then is it reasonable for researchers to also measure the impact of modernization on service requirements? Do firms or plants tend to cluster by the goals and measures they select? Future research needs to address these questions.

Extension of this line of research to product and material innovation as well as other economic sectors would be desirable. The production core of an office might follow the same general pattern shown in Figure 1 but with refinements in dimension measures. For example, what is the design-manufacturing equivalent in service? Is this relationship observable in the determination of services tailored to customers and the operating core that provides these services? In a bank, this interface might include marketing managers and the operations department. We were unable to develop a scale with sufficient internal consistency to measure manufacturing-marketing integration, but this construct shows promise. In an airline, this relationship might be manifested in decisions to purchase new routes and in the management of crew and aircraft operations as well as new airplane capacity designs. In extraction industries, an analogous relationship might involve the people who decide when and how to mine, cut, fish, or drive and turn locomotive units that carry out tasks.

The report of software problems raised a second issue, but in this case it relates to an internal integration problem. Software makes technological innovations of interest unique. This uniqueness implies another functional integration challenge—that of resolving conflicts between the information-processing function in organizations and the manufacturing function—which arises in these unique new circumstances. The software being developed to run, control, integrate, and schedule new flexible manufacturing technologies is fundamentally different from most software being used for business systems developed and maintained by information departments today. Yet organizations need to resolve information issues in manufacturing, which often leads to functional conflicts and turf issues. This second area of needed integration also requires attention and suggests alternative, unique performance measures.

Researchers should keep in mind that it is a sufficient challenge for most firms to adopt a program of just-in-time manufacturing, or a design-for-manufacture program, or negotiate a novel union contract. But close coordination of such efforts with significant process innovation is rare. Among such rare efforts is the development of integration mechanisms directed at customers. In this study, for the first time, both qualitative and quantitative data of sufficient reliability for examining these relationships were available.

The most important overall finding of this study was that the different types of integrative mechanisms studied affect performance uniquely and follow a consistent correlation pattern. This result suggests that organizations can fine-tune the integration process as a way of implementing their innovation and change strategies. Even though definitions of successful process innovation adoptions may vary by the measures selected, future research might address the issue of whether clusters of measures in other settings follow the general pattern found here. If the integrating mechanisms are theoretically robust, they may manifest in different ways in different circumstances. Performance measures may also vary, but if the model proposed here is correct, there should still be significant relationships between integration and innovating outcomes.

Perhaps the most salient issue this study raises is the question of why some of the plants and firms studied were more adept at organizational integration than others. Clearly, the source of ideas for internal and external integration is part of the answer to this question. Respondents were often justifiably evasive when questioned along these lines. It may be that the histories of firms, especially the experience profiles of their general managers, might help explain integration and modernization. Leadership and creativity could be prime candidates to explain these differences, and much research is already directed at the relationship between individual and organizational behavior for top management teams. More study needs to be focused on how other positions in organizations factor into the equation for successful innovation.

No attempt was made here to extend and test the model to situations beyond process technology adoption; for example, organizational integration could play a part in the successful introduction of new materials and products, even if patent protection (strong appropriability) were in force. Such an extension was beyond the scope of this study but raises other questions for future research.

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INFLUENCES OF INDIVIDUAL AND SITUATIONAL CHARACTERISTICS ON MEASURES OF TRAINING EFFECTIVENESS

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A model of individual and situational influences on individuals' training-related motivation and training effectiveness based on valence-instrumentality-expectancy theory was developed. A training program designed to improve proofreading skills was tested with 106 university employees. The findings supported the hypothesized relationship between learning and performance. Further, a hypothesized moderated relationship between training motivation and reactions, as related to learning, was supported. We obtained minimal support for the hypothesized antecedents of training-related motivation. A revised model was formulated in which reactions to training play a complex role, moderating some relationships yet mediating others.

Nearly all employees receive some form of training during their careers. Indeed, individuals rely on training to improve their current skills and to learn new skills. Training represents an expensive investment organizations make in their human resources and, therefore, it is important that organizations evaluate the effectiveness of their training efforts (Cascio, 1989). However, to maximize the benefits of training, researchers and practitioners must know more than whether it worked. Many authors have called for greater research attention to understanding why training works. In particular, several have suggested that developing a better understanding of participants' training-related motivation would provide useful insights into a neglected area related to training effectiveness (e.g., Campbell, 1988, 1989; Latham, 1988; Noe, 1986). In addition, there has also been a renewed interest in the types of measures used to evaluate the effectiveness of training and their

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interrelationships (e.g., Alliger & Janak, 1989; Tannenbaum & Yukl, 1992). Accordingly, the purpose of the present study was threefold. First, using a valence-instrumentality-expectancy framework, we developed a model that links individual and situational variables to individuals' training motivation. Second, we related training motivation to several outcome measures commonly employed to evaluate training effectiveness. In so doing, we proposed a different relationship among the outcome variables than has previously been considered. Finally, we tested the proposed relationships with data gathered from participants in a proofreading training program using "latent structural modeling" techniques (Jörekog & Sörbom, 1989).

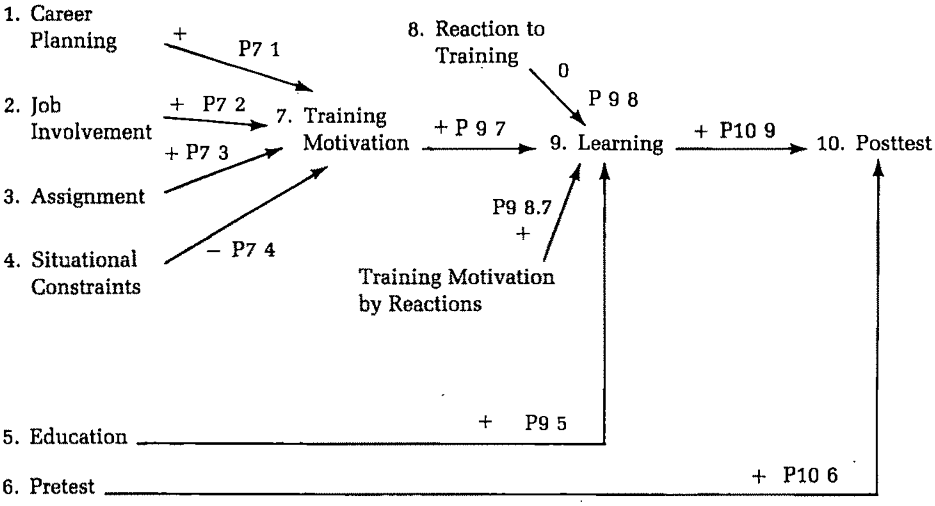
THEORETICAL FRAMEWORK AND HYPOTHESES

Antecedents of Training Motivation

Campbell (1988, 1989) noted that there has been a renewed interest in the influence of trainee motivation on training effectiveness. He suggested that researchers should devote greater attention to issues such as individual and situational influences on trainees' motivation and to trainees' cognitions regarding the instrumentality of training programs for obtaining desired outcomes. Several recent training effectiveness studies have been conducted within the general framework of valence-instrumentality-expectancy theory (Vroom, 1964). Noe (1986) submitted that trainees will be more motivated to perform well in training if they perceive that (1) high effort will lead to high performance in training, (2) high performance in training will lead to high job performance, and (3) high job performance is instrumental in obtaining desired outcomes and avoiding undesirable outcomes. It also follows that trainees will be motivated to do well if they perceive that performance in training will help them to obtain outcomes not directly tied to their current positions, such as career development opportunities.

Several authors have also suggested that a valence-instrumentality-expectancy approach should prove useful for studying training motivation (e.g., Baldwin & Ford, 1988; Farr & Middlebrooks, 1990; Tannenbaum, Mathieu, Salas, & Cannon-Bowers, 1991; Williams, Thayer, & Pond, 1991). In the current study, we adopted an instrumentality approach that examined training motivation in terms of trainees' perceptions that doing well in a program would lead to better job performance and consequently to valued outcomes. This approach is particularly useful because it permits the integration of both individual and situational variables as they relate to trainees' perceptions of various valence-instrumentality-expectancy components (Farr & Middlebrooks, 1990). Figure 1 depicts the model we tested. Each hypothesized path is labeled with a two-number index. The first number refers to the endogenous variable and the second number refers to the exogenous variable. We chose the variables that appear on the far left side of the figure as antecedents of training motivation on the basis of their theoretical relevance to training motivation and in particular, to the training program we examined. The middle and right side of Figure 1 show the

FIGURE 1
Hypothesized Structural Model



hypothesized relationships between training motivation and the extent to which trainees learn a program's material and also the relationships among training outcome measures. These links are discussed further below. First, however, we consider individual and situational influences on training motivation.

Previous research has found support for the influence of several individual variables on valence-instrumentality-expectancy cognitions. For example, Lawler and Suttle (1973) obtained significant correlations between individual role perceptions and ability measures and various valence-instrumentality-expectancy components and composites. James, Hartman, Stebbins, and Jones (1977) found support for the influence of several dimensions of psychological climate on instrumentality and valence ratings and, to a lesser degree, expectancy ratings. In a simulated organizational study, Jorgenson, Dunnette, and Pritchard (1973) found a significant correlation between manipulated effort-outcome probabilities and subjects' instrumentality ratings. Pritchard, DeLeo, and Von Bergen (1976) manipulated behavior-reward contingencies in a series of field experiments. Their findings illustrated significant effects for the manipulations on instrumentality and valence ratings, but not on expectancy ratings. In short, many investigations have obtained significant correlations between individual and situational variables and valence-instrumentality-expectancy cognitions in a variety of settings.

Individual Influences on Training Motivation

We hypothesized two individual variables as antecedents of training motivation. Noe (1986) suggested that trainees' career planning would be likely to have a positive influence on training motivation. If individuals who engage in greater self-exploration than do others are more likely to know their strengths and weaknesses, it follows that individuals who engage in more career planning are more likely to realize the potential benefits of training. Further, to the extent that doing well in training may prepare trainees for advancement or other career opportunities, those who report high career planning should be highly motivated. That is, individuals who engage in extensive career planning should perceive training to be highly instrumental for obtaining valued career opportunities. Noe and Schmitt (1986) found career planning and training motivation to be positively, but not significantly, correlated. However, their sample included only 44 people, a size offering little statistical power. Thus, we hypothesized that trainees' career planning would relate positively to their training motivation (P7 1 in Figure 1).

A second individual variable that we hypothesized to influence training motivation was job involvement. Job involvement is "the degree to which the job situation is central to the individual and his/her identity" (Blau, 1985: 34). Individuals who are highly involved in their jobs should value work-related outcomes that follow from doing well in training. Thus, we anticipated a positive relationship between job involvement and a valence-weighted measure of training motivation. This conceptual premise has received some empirical support as well. Noe and Schmitt (1986) obtained a significant, positive correlation between trainees' job involvement and pretraining motivation. Clark (1990) found that individuals' job involvement significantly predicted training motivation even after the perceived utility of a program had been considered. In the current study, a training needs analysis (Goldstein, 1986) showed that the proofreading course participants took taught skills that were clearly part of their jobs. Thus, on both theoretical and empirical grounds, we hypothesized that job involvement would relate positively to training motivation in the training context we studied (Figure 1, P7 2).

Situational Influences on Training Motivation

Two characteristics of the situation studied were hypothesized to influence training motivation. Trainees either volunteered to participate in the program of interest or were signed up by their supervisors or according to a departmental policy. We assumed that trainees used a rational decision process and thus anticipated that individual choice would relate positively to training motivation. The rationale here is that volunteers perceive participation as offering some positive utility. In contrast, there are fewer assurances that people who are told they must participate in a program will see it as beneficial. Indeed, some people are likely to have a negative reaction to being told that they have to attend a particular course.

Hicks and Klimoski (1987) manipulated trainees' choices concerning whether to attend a training program. They found that individuals who had a high degree of choice demonstrated greater satisfaction with the program, higher motivation to learn, more positive reactions, and better performance on an achievement test than those who had little choice. Ryman and Biersner (1975) found that having a choice whether to participate in training led to greater training success and fewer voluntary withdrawals from training. In a laboratory experiment, Baldwin, Magjuka, and Loher (1991) found that when trainees were given a choice of several programs to attend and subsequently received their top choice, they reported higher pretraining motivation and learned more than did trainees who were not given a choice. Accordingly, we hypothesized that individuals who nominated themselves for the training we studied would perceive a greater instrumentality for the program and report higher training motivation than those who were assigned by other methods (Figure 1, P7 3).

Goldstein (1991) argued that work environment perceptions influence trainees' motivation to learn as well as various outcome measures. Situational constraints are characteristics of a work situation that interfere with employees' work performance (cf. Peters & O'Connor, 1980; Peters, O'Connor, & Eulberg, 1985; Phillips & Freedman, 1984). Peters and colleagues (1985) identified 11 features of work environments that may constrain individuals' work performance; examples are lack of materials and supplies, times allowed to complete tasks, and lack of information. Peters and O'Connor argued that employees confronted with situational constraints become frustrated because they cannot translate work motivation into higher performance. Further, taking a valence-instrumentality-expectancy perspective, those authors hypothesized that frustration produced by situational constraints would reduce employees' motivation by reducing their expectancy perceptions. Phillips and Freedman (1984) found empirical support for a negative relationship between individuals' perceptions of situational constraints and their work motivation. In the present context, if trainees believe that learning new skills will not be instrumental in gaining valued outcomes because their job performance is constrained, they will not be motivated to perform well in training. Thus, we included a negative path from situational constraints to training motivation in our model (Figure 1, P7 4).

Training Effectiveness Measures

The model depicted in Figure 1 not only suggests that individuals enter training with differing levels of motivation resulting from their personal characteristics and work environments, but also predicts that trainees who are motivated to do well in training will learn the content or principles of a training program better than less motivated participants. Pretraining motivation may prepare trainees to learn by heightening their attention and increasing their receptivity to new ideas. Motivated trainees should, therefore, be more primed, or ready to learn. Several studies have found empirical support for a link between trainees' motivation and learning (cf. Baldwin et al., 1991; Clark, 1990; Hicks & Klimoski, 1987; Ralls & Klein, 1991). Accordingly, we hypothesized that, in general, training motivation will relate positively to the extent to which individuals learn training material (Figure 1, P9

7). However, we further hypothesized that trainees' reactions to a program would moderate the relationship between training motivation and learning. More specifically, we hypothesized that the relationship between training motivation and learning would be stronger for individuals who reacted positively to the program studied than for those who did not respond as positively.

The relationships among trainees' reactions, learning, and behavior change illustrated in Figure 1 depart from those endorsed by traditional training evaluation studies. Perhaps the most widely accepted method for evaluating effectiveness is Kirkpatrick's (1976) four-level approach (Alligar & Janak, 1989), which includes (1) trainees' reactions to a training program and its content, (2) learning, or trainees' acquisition of knowledge or skills, (3) behavior, or changes in the extent to which trainees can execute desired training-related behaviors, and (4) results, or the extent to which trainees' job behaviors change and result in increased organizational effectiveness. Researchers have commonly assumed that these four levels are hierarchically linked in a linear fashion. For example, Hamblin argued that "We are assuming that there is a cause-and-effect chain . . . [which] can be set out as follows: training leads to reactions, which leads to learning, which leads to changes in job behavior, which leads to changes in the organization, which leads to changes in the achievement of ultimate goals (1974: 15)."

The research evidence concerning the validity of linear relationships between the different effectiveness criteria, however, has been inconclusive (cf. Latham, Wexley, & Pursell, 1975; Lefkowitz, 1972). This inconclusiveness led Alliger and Janak (1989) to question whether the four levels of criteria are necessarily linked in the fashion Kirkpatrick's framework implies. They conducted a meta-analysis of training evaluation studies that assessed two or more of Kirkpatrick's four criteria levels and concluded that the relationship between reactions and learning is weak, whereas the relationships among learning, behavior, and results appear much stronger. They offered a second model that considered reactions to training as one criterion and learning, behavior, and results as a second, interrelated criteria set. Alliger and Janak (1989) and Clement (1982) suggested that trainees' motivation and attitudes, the context of training, and other influences may attenuate observed relationships between trainees' reactions to a program and other criterion measures.

Our position is that there is no theoretical reason why reactions should be linearly related to learning or to other outcome measures. In fact, Alliger and Janak suggested that "perhaps it is only when trainees are challenged to the point of experiencing the training as somewhat unpleasant that they learn" (1989: 334). However, reactions may influence the relationships between other variables of interest, such as motivation, and the extent to which trainees learn a course's content. As outlined earlier, we hypothesized that, in general, trainees who are highly motivated will learn more than those who are less motivated (Figure 1, P9 7). Indeed, individuals who enter training unmotivated are not likely to learn much even if they enjoy a program, simply because they are not prepared to learn. On the other hand, a negative reaction to a program may turn off even motivated trainees, reducing their attention, lowering their receptivity to new ideas, and inhibiting learning. Thus, we anticipated the following ordinal interaction (P9 8.7): training motivation will exhibit a steeper positive slope with learning for individuals who react positively to a program than for those who react less positively (Pedhazur, 1982). In agreement with Alliger and Janak (1989), we did not anticipate a significant linear relationship between trainees' reactions to a program and their learning scores (P9 8), although we did hypothesize that learning would relate positively to performance improvement (P10 9).

METHODS

Participants

Employees from a large state university in the Northeast participated in training sessions offered by the institution's human resource department, each of 140 participants attending one of seven 8-hour series. The employees worked primarily in clerical and administrative assistant positions. We mailed surveys containing pretraining measures to all individuals signed up for the program one week before they were scheduled to begin. Trainees were asked to complete the surveys and to bring them to their first sessions. At the first session, trainees received a general overview of the program and were administered a pretest behavior measure. They then started the training. At the completion of the program, participants completed a reactions survey, a learning measure, and a posttest behavior measure, in that order. Unfortunately, 20 participants failed to complete the pretraining survey, and another 14 individuals had to be dropped because they missed one or more sessions as a result of scheduling difficulties. Thus, complete data were available for 106 people (76 percent of the original group). Supplemental analyses of the data that were available for people who were dropped indicated that they did not differ significantly from those for whom we had complete data. Women composed 97 percent of the study group, and their average age was approximately 27 years.

Training Program

The training program was designed to enhance employees' proofreading skills in terms of both quality and quantity. The program was conducted in a series of four 2-hour modules presented one per week. In each module, a particular topic was presented on videotape; examples were page-scanning techniques, grammar, and punctuation rules. Structured practice sessions followed. Participants then received feedback concerning how well they mastered each topic or skill.

Pretraining Survey Measures

The survey mailed prior to the first training session assessed participants' perceptions of their work environments, training-related motivation, and individual variables. All responses were made on seven-point Likert-type scales, with high values representing high levels of each variable, unless otherwise specified below. We computed scale scores for each variable by averaging the items to which a participant responded.

A 16-item measure of perceived *situational constraints* was developed on the basis of the work of Peters and colleagues (1985). This scale included items questioning the extent to which employees: (1) received adequate information from sources other than the training, (2) had adequate equipment and supplies, (3) had sufficient authority to complete tasks, and (4) had enough time to complete their jobs successfully. Dropping two items exhibiting low average interitem correlations resulted in a 14-item scale ($\alpha = .85$). Using an open-ended question, we also asked participants how they had enrolled in the program and derived an *assignment* variable, coded 2 if they had volunteered, and 1 if they were enrolled in the program by their supervisor or according to a departmental policy.[1]

Individuals' *career planning* was assessed using a 6-item scale ($\alpha = .78$) drawn from Gould (1979). Gould and Noe and Schmitt (1986) provided evidence for the internal consistency and discriminant validity of this measure. A representative item from this scale is "I know what I need to do to reach my career goals." *Job involvement* was assessed with six items drawn from Lodahl and Kejner (1965). Mathieu and Farr (1991) provided evidence for the internal consistency of this scale and support for its having discriminant validity from measures of organizational commitment and job satisfaction. However, we dropped two items exhibiting low average interitem correlations in the present study, leaving a 4-item scale ($\alpha = .75$). Individuals were also asked to report the highest level of *education* they had obtained: responses ranged from high school diploma, 1, to a bachelor's degree, 5.

Individuals' *training-related motivation* was assessed with expectancy-theory based scales adapted from Lawler (1981). Lawler and Suttle (1972) and Cammann, Fichman, Jenkins, and Klesh (1979) presented evidence regarding the psychometric characteristics of similar scales. We measured expectancy perceptions with six items assessing the relationship between doing well in training and high job performance; for example, "Successful completion of this training course will help me produce higher quality work" ($\alpha = .88$). We measured instrumentality and valence in terms of 11 job-related outcomes, such as a salary increase and being respected by coworkers. We computed 11 composite motivation scores by multiplying each outcome's valence rating by its instrumentality rating and multiplying each composite by the expectancy scale rating. One composite exhibited low intercorrelations with the other 10 and was dropped. We averaged the remaining 10 composites ($\alpha = .88$).

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[1] Some controversy exists concerning the use of categorical variables in LISREL analyses. Although research is ongoing on this matter, it appears that the standard errors for dichotomous variables may be inflated in LISREL analyses, which reduces the likelihood of finding significant results (Bollen, 1989). Therefore, our results concerning the influence of assignment are likely to be conservative estimates. Further, we reconstituted our covariance matrix using PRELIS, a preprocessor for LISREL also developed by Jöreskog and Sörbom (1988). Among other features, PRELIS can calculate polyserial correlations that estimate the "true" underlying relationships between differently scaled variables such as dichotomous, ordinal, and interval variables. In brief, we reestimated all our models using the revised covariance matrix produced through PRELIS, but the results did not differ in any respect from those reported.

Pretest and Posttest Behavior Measures

Trainees' development during the program was evaluated by comparing their scores on parallel pretraining and posttraining work sample measures. Each measure presented two memos to participants that contained 50 mistakes. The trainees' goal was to identify as many mistakes as possible in a five-minute timed session. Their score was the number of mistakes they correctly identified on each test. Two coders independently scored 15 percent of the *pretest* and *posttest* measures; interrater reliabilities were .999 and .988 on the two tests, respectively. On the average, trainees identified 18.54 (s.d. = 6.07) mistakes on the pretest and improved significantly ($t_{105} = 18.68$, $p < .001$) to an average of 29.72 (s.d. = 7.12) on the posttest.

Learning

A 20-item multiple choice *learning* test based on the content of the training modules was constructed. The items focused upon principles of the program, such as which of the several scanning techniques described fit which type of correspondence, and punctuation rules. The scale reliability (KR-20) of the 20 items (coded 1 = correct, 0 = incorrect) was .81. Participants' learning scores were calculated as their average number of correct responses.

Reactions to Training

Participants' *reactions to training* were assessed with an 11-item scale ($\alpha = .81$) that considered both their affective reaction (e.g., "What is your overall reaction to the Training course?") and the perceived relevance of the course to their jobs (e.g., "How valuable was the course content to performance on your current job?"). Responses were on five-point Likert-type scales, with higher values representing more positive reactions.

Analysis Strategy

The model presented in Figure 1 contains two paths we have not yet discussed because of the design of our study. First, the training program we studied presented new information to participants, which precluded the use of pre-post learning measures. Thus, we developed the content-based learning measure from course materials. The implication for the hypothesized model was that we anticipated that individuals' education would influence their scores on the learning measure. Thus, we included a path from previous education to learning to control for the potential effects of educational differences (P9 5).

The second path in the model demanded by our study design related to the performance scores. To account for initial differences in trainees' skills, we controlled for their pretest behavior scores when examining the influence of other factors on their posttest behavior scores (Figure 1, P10 6). The hypothesized model also includes both mediated and moderated hypothesized relationships. Although structural models are generally limited to linear relationships, Baron and Kenny (1986) and Cohen and Cohen (1983) have discussed how moderated relationships may also be incorporated. We tested the model using LISREL VII (Jöreskog & Sörbom, 1989). The relatively small study group precluded the simultaneous estimation of both the measurement and structural models. However, we used the scale reliabilities noted above to fix the relationships between the observed scale scores and their corresponding latent constructs, as well as the error variances for each variable. This approach is also consistent with a method Busemeyer and Jones (1983) advocated for testing moderated relationships in latent structural models, which is described further below. Jöreskog and Sörbom (1989: 171–187) outlined how the reliabilities of observed scores can be used to estimate latent variables in a structural model tested using a covariance matrix. Specifically, the path from a latent variable to its corresponding observed variable (lambda) is equal to the square root of the reliability of the observed score. In addition, the associated amount of random error variance (theta) is equal to one minus the reliability of the observed score times the variance of the observed score.

Trainees' education levels and assignment methods were each assessed with single items, so reliability scores are not available. Nevertheless, it is reasonable to assume that single-item measures are less than perfectly reliable. We employed a strategy recommended by Anderson and Gerbing (1988), who suggested that a conservative approach is to assume a reliability of .90 for single-item measures. Finally, we standardized both training motivation and reactions so that we could apply a formula advanced by Bohrnstedt and Marwell (1978) to calculate the reliability of the interaction term. Their formula takes into account the reliabilities of both variables used to form a product term and the correlation between the two latent variables; for training motivation and reactions, it yielded a value of .77.

Four indexes were used to evaluate the fit of the structural models: the chi-square test, the goodness-of-fit index (GFI), the root-mean-squared residual (RMSR), and a Tucker-Lewis (1973) incremental fit index (T-L). Chi-square is sensitive to sample size and in the present case has relatively *low* power to detect a misspecified model. Therefore, the statistic should be interpreted cautiously. The goodness-of-fit index indicates the relative amounts of the covariances among the latent variables that are collectively accounted for by a hypothesized model. The root-mean-squared residual is a measure of the average of the fitted residuals; when a covariance metric is analyzed, it must be interpreted relative to the magnitude of the variables' variances and covariances.

The Tucker-Lewis index compares the fit and degrees of freedom of a given structural model against those of a baseline model, typically, an uncorrelated or null latent model. Sobel and Bohrnstedt (1985) suggested that a null baseline model is too restrictive and recommended the use of "informed baseline models" for comparative purposes. In the present case, we used a null structural model, according to which none of the paths depicted in Figure 1 would be significant, as an appropriate baseline model. Although there are no statistical significance tests for the goodness-of-fit, Tucker-Lewis, and root-mean-squared residual indexes, convention suggests that the values of the first two should exceed .90 and that the value for the last should be fairly low to support a hypothesized model.

RESULTS

Table 1 presents descriptive statistics for and observed correlations among all study variables, and correlations among the latent variables. However, we used the covariance matrix for all model tests. Figure 2 presents the results of the hypothesized model, and Table 2 summarizes the model fit indexes. Although the hypothesized model represented a significant improvement over the null structural model that predicts no significant paths [χ^2 difference (10) = 63.84, $p < .01$], its fit was less than ideal [$\chi^2(31) = 62.33$, $p < .05$; T-L = .513; GFI = .913; RMSR = .379]. Nevertheless, many hypothesized relationships were statistically significant. Specifically, the hypothesized direct influences of pretest and learning scores on posttest performance were significant and in the hypothesized directions (Figure 2, P10 6 and P10 9, respectively). The influence of education on learning (P9 5) was also positive and significant. To assess the linear effects of training motivation and reactions on learning, we examined the significance of the paths in the model that did not include the interaction term. Neither path was significant (P9 7, $\beta = .145$, P9 8, $\beta = -.054$). We tested the significance of the interaction by comparing the chi-square values for models including and excluding the product term. As illustrated in Table 2, the model that included the interaction term (P9 8.7) yielded a significantly better fit [χ^2 difference (1) = 3.84, $p = .05$]. The interaction term related to the learning parameter of the hypothesized model also exhibited a significant t value (>2.0). A plot of this interaction (not shown) revealed the expected disordinal form, with training motivation demonstrating a stronger positive relation with learning among individuals who responded positively to the program. Finally, none of the hypothesized antecedents of participants' training motivation were significant (P7 1, P7 2, P7 3, P7 4).

Although some of these findings are encouraging, clearly the hypothesized model did not fit the data. We thus revised the model using a two-step procedure. First, we deleted nonsignificant paths, dropping the paths from the four hypothesized influences on individuals' training motivation. We kept the nonsignificant paths from training motivation and reactions to training, as related to learning, however, because they must be present for evaluation of the significance of the interaction component. Next, we added

TABLE 1
Correlations Among All Observed and Latent Variables[a]

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Pretest	.999[b]	.072	.041	.190	−.181	.025	.005	.163	.245	.574	.190
2. Education	.076	.900[c]	.083	−.177	.038	−.200	.073	−.072	.235	.031	.088
3. Career planning	.046	.099	.777[d]	−.102	.103	−.149	.079	.070	.017	.006	−.062
4. Assignment	.201	−.197	−.122	.900[c]	.050	−.185	.151	.289	−.008	.161	.232
5. Job involvement	−.209	.046	.135	.061	.751[d]	−.171	.088	−.100	−.234	−.149	−.129
6. Situational constraints	.027	.027	−.183	−.212	−.214	.850[d]	−.170	−.012	−.243	−.074	−.091
7. Training motivation	.005	.082	.095	.170	.108	−.196	.882[d]	.427	.118	.056	−.116
8. Reaction to training	.181	−.084	.088	.338	−.129	−.014	.505	.812[d]	−.019	.250	.082
9. Learning	.272	.276	.022	−.009	−.300	−.293	.140	−.024	.807[e]	.309	.158
10. Posttest	.578	.033	.006	.171	−.172	−.080	.060	.279	.347	.988[b]	.191
11. Training motivation by reactions	.216	.105	−.080	.278	−.170	−.112	−.140	.104	.200	.218	.774[f]
Means	18.54	2.31	4.81	1.81	2.68	3.01	0.00	0.00	0.54	29.72	−0.43
Standard deviations	6.07	1.05	1.12	0.39	1.10	0.78	1.00	1.00	0.14	7.12	0.91

[a] Zero-order correlations appear in the upper-right triangle, correlations among the latent variables in the lower-left triangle. Diagonal entries represent variable reliabilities. $N = 106$. For correlations $\geq .160$, $p < .05$; for those $\geq .250$, $p < .01$.

[b] Statistic represents interrater reliability.

[c] This is a fixed value.

[d] Statistic is a Cronbach's alpha.

[e] This is a KR-20 statistic.

[f] Statistic was computed using Bohrnstedt and Marwell's (1978) formula.

TABLE 2
Summary of Fit Index Results[a]

			Model Fit Indexes		
Models[b]	*df*	χ^2	Tucker-Lewis	Goodness-of-Fit	Root-Mean-Squared Residual
1. Hypothesized, with interaction	31	62.33*	.513	.913	0.379
2. Hypothesized, without interaction	32	66.17*	.486	.909	0.435
3. Final revised, with interaction	31	32.02	.984	.950	0.440
4. Final revised, without interaction	32	35.98	.940	.945	0.511
5. Null structural	41	126.17*	na	.830	3.074

[a] N = 106.
[b] The interaction term was training motivation by reaction to training.
* $p < .05$

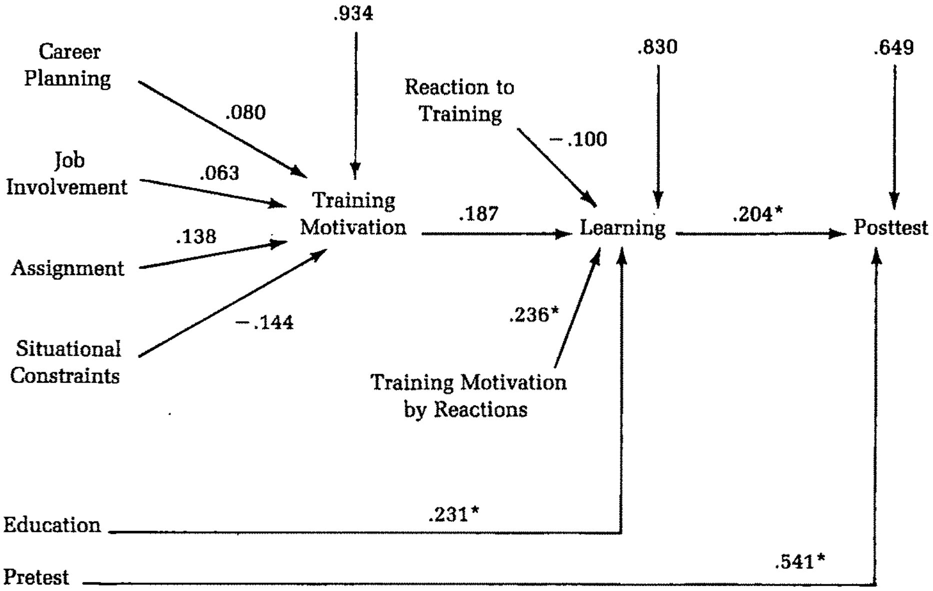
paths to the model if they (1) were consistent with the theoretical foundation advanced earlier and (2) yielded significant results. We emphasize that *this revision phase was exploratory* and simply yields one of several potential models that could account for the relations among these data (cf. Stelzl, 1986).

The revised model, presented in Figure 3, contains an additional positive path from assignment method to reactions to training and a direct path from reactions to training to posttest performance. In addition, after the four hypothesized antecedents of trainees' motivation had been dropped, situational constraints exhibited a marginally significant ($p < .10$) negative path that we reintroduced, given its hypothesized role in the model and the relatively low power of these analyses (James, Mulaik, & Brett, 1982). As expected, the revised model fit the data quite well, both compared to the null structural model [χ^2 difference (10) = 94.15, $p < .01$] and in general [$\chi^2(31)$ = 32.02, n.s; T-L = .984; GFI = .950; RMSR = .440]. Further, the revised model that included the interaction term represented a significantly better fit [χ^2 difference (1) = 3.96, $p < .05$] than the revised model without the interaction term.

DISCUSSION

The present study was designed to investigate two issues related to training effectiveness. First, we developed a model, based on a valence-instrumentality-expectancy framework, that specified antecedents and effects of training motivation. We hypothesized that individual and situational characteristics would influence the motivation of participants in a training program, which in turn was hypothesized to influence the extent to which they learned the content of a course. Second, we advanced a different con-

FIGURE 2
Results of the Hypothesized Model[a]

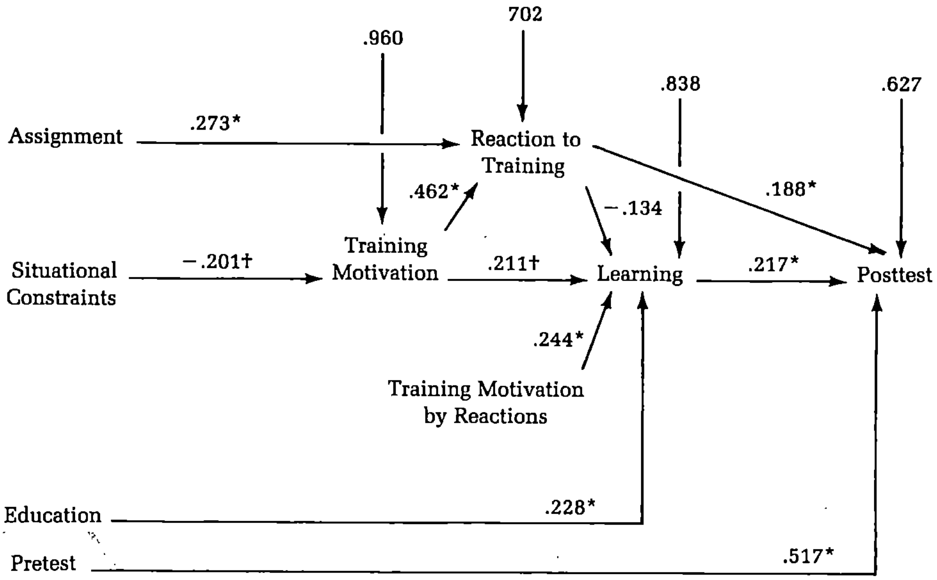


[a] N = 106.
* $p < .05$

ception of the relationship among Kirkpatrick's (1976) training criteria than has previously been assumed and hypothesized that reactions to training would moderate the relationship between individuals' training motivation and learning scores. Results of various fit index tests failed to support the hypothesized model. We developed a revised model that contained seven of the original paths, dropped three others, and added two originally omitted paths.

The revised model fit the data quite well and is offered as a starting point for future research. In terms of our original aims for this study, we found virtually no support for the hypothesized antecedents of individuals' training-related motivation. We had anticipated that individuals who reported high levels of career planning and job involvement would also report high training motivation. Neither variable exhibited a significant influence on training motivation or on any other variable in the model. One potential explanation for these findings may lie in the nature of the training program that we investigated. The proofreading course was designed to enhance participants' skills on a task they perform in their current jobs. Individuals with higher career goals may not have valued training designed to enhance skills that pertained primarily to the current jobs. Thus, trainees with strong career plans may not have perceived the proofreading program as instrumental in obtaining highly valued outcomes. With regard to job involvement, proof-

FIGURE 3
Results of the Revised Model[a]



[a] N = 106.
† p < .10
* p < .05

reading does not represent the most enriched portion of the participants' jobs. Proofreading simply may not be energizing to a highly involved employee, although other types of training may be. Thus, upon reflection, perhaps individuals who were highly involved in their jobs or who had greater career plans did not see the program as instrumental in obtaining valued outcomes.

Perceived situational constraints did have a marginally significant, negative impact on trainees' motivation. This finding is consistent with previous work by Peters and colleagues (1985) and Phillips and Freedman (1984). Other authors (Campbell, 1988, 1989; Noe, 1986) have suggested that situational constraints may limit the extent to which individuals can transfer learning to a work environment. The collective findings suggest a potentially debilitating negative cycle stemming from situational constraints. For example, trainees could be expected to become frustrated if they developed new skills in training yet were not given adequate time, resources, and so forth, to apply what they learned to their jobs. Such frustration would most likely have a negative effect on how individuals approached future training programs that would in turn reduce the effectiveness of training. Thus, situational constraints are not only likely to limit the extent to which trainees can transfer learning to their work environments; foreknowledge of constraints is likely to stifle the learning process itself. There has recently been a movement toward establishing continuous learning environments in many organizations (Rosow & Zager, 1988). The debilitating negative cycle we described would directly interfere with attempts to implement a continuous learning philosophy.

As for the second aim of our study, results of the revised model support the role of reactions to training as a moderator of the relationship between training motivation and learning. Furthermore, we found training reactions to play a complex role linking individual and situational influences to different criteria measures. Specifically, although reactions to training moderated the relationship between training motivation and learning, they also mediated the influences of training motivation and assignment method on posttest performance scores. Both high training motivation and self-assignment led to positive reactions to the program, which in turn led to high scores on the posttest. Thus, reactions to training simultaneously operated as a mediator of some relationships and a moderator of others (cf. Baron & Kenny, 1986). This is the first study to hypothesize, test, and confirm such a complex role for training reactions in explaining training effectiveness.

These findings provide one explanation for Alliger and Janak's (1989) observation that reaction criteria measures generally exhibit low correlations with learning measures. Had we examined only linear relationships, we would have reached the conclusion that reactions have no significant effects on learning. However, our findings suggest that participants' reactions to the program played a multifaceted role in linking individual and situational characteristics to other training effectiveness measures. The implications of this finding are that reactions are important for training effectiveness, but not in and of themselves. The best results were observed when trainees were both motivated to do well and reacted positively to the program. If trainees were not first motivated, or if attention had been directed solely at making training enjoyable at the expense of developing skills, less than optimal results would have been obtained.

The current results also indicate that trainees reacted more positively to the program studied here if they decided to participate rather than being assigned to training. The implications of this result must be tempered, however, by Baldwin and colleagues' (1991) findings that trainees who are asked their preferences for training but do not receive their top preference report lower training motivation and learning than do people who were not offered a choice at all. Thus, practitioners should ensure that employees receive the training they need to be successful in their jobs while minimizing potential reactance stemming from forcing individuals into programs. Perhaps making employees formally part of a training needs analysis helps achieve such a delicate balance. This area is a ripe one for future work.

The current study is not without limitations. First, our study group was somewhat small, reducing the extent to which we could obtain significant relationships. The group size also prevented us from simultaneously testing a measurement model and the structural models. Second, although we contrasted the fits of both the hypothesized and revised models with and without interaction terms, we did not exhaust the number of models that could be fitted to these data (Stelzl, 1986). This limitation, combined with the fact that the revised model was guided in part by the magnitude of the correlations, suggests that the present findings should be replicated.

As have previous researchers (e.g., Noe & Schmitt, 1986), we adopted a valence-instrumentality-expectancy perspective toward the study of trainees' motivation. In particular, our model examined the perceived relationship between performance in training and performance in individuals' jobs, the perceived instrumentalities connecting job performance and a set of outcomes, and the valences of the outcomes. Therefore, our orientation is best considered as an instrumentality framework because we did not include a component relating perceived effort and performance in training. Had we included effort-performance expectancies, other antecedents of training, such as self-efficacy, may have become more relevant (Gist, 1987). However, this omission does not undermine the importance of the current findings; training motivation, as we measured it, did relate significantly to learning when examined together with participants' reactions. Nevertheless, we suggest that future research should not only explore the roles of different antecedents of training motivation, but should also investigate other conceptions of training-related motivation.

Further research also needs to consider potential boundary-setting conditions relevant to the study of training effectiveness. For example, the purpose of training may have a significant impact on the importance of different antecedents of training motivation. The proofreading course examined in the current study was primarily designed to enhance an important skill used in the participants' current jobs. This course dealt with a very specific and technical skill, which could limit the generalizability of our findings. Had we examined a less technical and specific course, or training targeted at socialization, updating skills, career progression, or other issues, the importance of the antecedents of training may have differed. Therefore, future research needs to consider the scope and nature of the training programs that are examined and the generalizability of the programs and populations that are sampled. A second potential boundary condition could be the training stimulus, or course design. For example, the individual and situational variables that influence training effectiveness may differ depending on whether training is presented in a simple lecture format or takes a more active behavior-modeling form.

In summary, we consider the results of this study to be a first step toward the development of an integrative model of training effectiveness. Our findings should be replicated in other settings and with other types of training programs. We recommend that the approach be expanded to include variables related to the transfer of behaviors learned in training to actual job environments, and the boundary conditions of models.

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RESEARCH NOTES

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THE PAST IS THE PAST—OR IS IT? THE USE OF RETROSPECTIVE ACCOUNTS AS INDICATORS OF PAST STRATEGY

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This study challenges the common assumption that retrospective accounts of business strategy are reliable and valid. Chief executives reported their firms' current strategies, and two years later, they reported their firms' strategies of two years earlier. Of these retrospective accounts, 58 percent did not agree with the previous and validated reports of past strategy. Retrospective errors appear to occur systematically and may be attributable to faulty memory or to attempts to cast past behaviors in a positive light.

Researchers in strategic management and organization theory have often relied on individuals' retrospective accounts as a means of reconstructing the past. For example, executives' retrospective accounts have recently been used alone, or in conjunction with other methods, to identify firm strategy (Boeker, 1989; Feeser & Willard, 1990), planning processes (Eisenhardt & Bourgeois, 1988; Mintzberg, Raisinghani, & Theoret, 1976; Nutt, 1987), and strategic and organizational change (Eisenhardt & Schoonhoven, 1990; Smith & Grimm, 1987). I am aware of no studies, however, that have systematically explored the reliability and validity of chief executive officers' (CEOs') retrospective accounts. To fill this gap in the research literature, this study empirically tested the assumption that retrospective accounts of past strategies are accurate. Specifically, the following questions were explored: (1) To what extent do CEOs accurately recall and report their firms' past strategies? and (2) Under what conditions are retrospective accounts most and least accurate?

Answering these questions is important because in many cases eliciting accounts of the past from key informants (Seidler, 1974) or groups of individuals is the only way to obtain information about past strategy. Even when

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archival data are available, a researcher must frequently employ retrospective accounts to interpret the data. For instance, Schwenk noted that researchers who merely observe organizational decision processes (as opposed to also relying on retrospective accounts) may "see decision processes as quasi-random simply because they lack the knowledge about the organization necessary to find the order that exists in its decision processes" (1985: 501).

DETERMINANTS AND FREQUENCY OF RETROSPECTIVE ACCURACY

There are a number of reasons to expect individuals in the upper echelons of organizations to accurately recall their firms' past (and often continuing) strategies. First, formulating and implementing a firm's strategy is typically a high-involvement activity for its CEO, both behaviorally and cognitively. An implication of the considerable salience of the firm's past strategy, which results from its importance to the organization and its personal relevance to the CEO, is that the CEO should be able to recall it accurately (cf. Petty & Cacioppo, 1986). Second, the effects of a strategy of the recent past are generally enduring and thus, the CEO may be continually reminded of earlier strategic decisions (cf. Tulving & Pearlstone, 1966). Third, in a firm that has recently and intentionally begun to alter its strategy, management might be acutely aware of from whence the firm came since the change process is often disruptive, conflict ridden, and expensive in the short run (Pennings, 1985). Finally, anecdotal evidence from research on formal strategic planning processes suggests that such processes significantly increase the salience of past and present strategies (Quinn, 1980; Vancil & Lorange, 1975).

The above arguments notwithstanding, a small number of management researchers (Huber & Power, 1985; Schwenk, 1985) have implied that some pitfalls may be associated with the use of retrospective accounts. For instance, individuals may attempt to project a socially desirable image by casting a light of rationality upon their past decisions (Cannell & Henson, 1974; Feldman & March, 1981; Salancik & Meindl, 1984; Tedeschi & Melburg, 1984). Or respondents with good intentions may misrepresent the past as a result of either the "hindsight bias" (Fischhoff & Beyth, 1975) or of subconscious attempts to maintain their self-esteem (Nisbett & Wilson, 1977). On a related note, Huber and Power (1985) stated that people's needs for achievement, security, and social acceptance may affect the likelihood that they will accurately recall past events—which is conceptually different from accurately reporting past events (cf. O'Reilly, 1978).

Despite a variety of arguments for and against the use of retrospective data, researchers have not yet empirically investigated the integrity of such data in strategic management research. In an attempt to redress this problem, I put the exploratory question of whether retrospective inaccuracies are common or rare to a relatively simple empirical test, which can be expressed formally as:

Hypothesis 1: A CEO's account of a firm's strategy at a given time, elicited at that time, will differ from that CEO's retrospective account of that strategy elicited at a later time.

METHODS

Overview

Identical questionnaire instruments were presented twice to the CEOs of 570 primary care hospitals located in 45 states.[1] Two years elapsed between the administration of the first and second instruments. Response rates for both surveys were high (77 and 82 percent, in 1984 and 1986, respectively). Since the present study concerned CEOs' ability to recall strategies of time 1 (1984) at time 2 (1986), the analyses were limited to the 259 hospitals for which (1) complete data were available and (2) the CEOs had not been replaced over the two-year period; 117 of the 570 CEOs had been in their positions for less than two years in 1986 and thus were excluded from the study. There were no statistically significant differences with respect to profitability or the distribution of strategies pursued between the 259 hospitals studied and the 311 that were excluded according to these criteria. Eighty-six percent of the hospitals were in the private, for-profit sector, and each hospital was owned by one of eight multihospital corporations. I used both primary and secondary data in the validation of the strategy measures but only the survey data for the hypothesis test.

Measures

Time 1 strategy. A hospital's current strategy was assessed with a procedure based on the Miles and Snow (1978) typology of generic strategies and previously adopted by Hambrick (1981), Snow and Hrebiniak (1980), Zajac and Shortell (1989), and myself (Golden, 1992). Miles and Snow's four strategic types are the defender, the analyzer, the prospector, and the reactor. It should be noted that the hospital industry was one of the four industries from which Miles and Snow derived their typology. Thus, the typology is particularly appropriate for categorizing hospital strategies.

During the first wave of data collection, in 1984, CEOs were presented with characterizations of the four strategic types, labeled Hospitals A through D and worded for use in the hospital industry (see Appendix A). Each CEO indicated the type to which his or her hospital was currently most similar using a seven-point scale. As in Hambrick's (1981) study, a rating of either 1 or 2 represented similarity to hospital A, the defender; 3, 4, or 5, to hospital B, the analyzer; and 6 or 7, to hospital C, the prospector. CEOs who viewed their organizations as lacking consistent strategies indicated similarity to hospital D, the reactor, which was not on the scale. A "not applicable" response was also available to the CEOs. The responses were collapsed into the four Miles and Snow nominal categories for analysis (cf. Snow & Hrebiniak, 1980; Zajac & Shortell, 1989).

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[1] The data were collected as part of a larger research program conducted by Shortell, Morrison, and Friedman (1990).

Using the same data set as the present study, Shortell and Zajac (1990) investigated the ability of the time 1 strategy assessment—the nominal categorizations—to differentiate between strategy types by comparing the CEOs' assessments with product-market data from the American Hospital Association. Supporting the validity of the strategy assessment, in comparisons of the three strategic types, the CEO-reported prospectors were more likely than the analyzers and the analyzers were more likely than the defenders (1) to offer a greater number of diversified services in a current year than other hospitals, (2) to have offered a greater number of diversified services during the past three years, and (3) to place greater emphasis on new services and new market development strategies. Each of these findings was significant at the .05 level or better.

Retrospective measure of time 1 strategy. As part of the second wave of data collection, in 1986, each CEO was asked to identify the hospital's business strategy of two years ago (time 1), using the same strategy typology.

Analysis

My hypothesis about the reliability of the retrospective accounts was examined using frequency data. Specifically, I was interested in the correspondence between the reported time 1 strategies and the retrospective accounts of the time 1 strategies reported at time 2. Since a measure's reliability sets an upper bound for its validity, I would only explore the validity of the retrospective accounts if reliability were established.

RESULTS

Table 1 presents frequency data for each of the four strategy types for (1) the previously validated time 1 measure and (2) the time 2 retrospective measure. In 150 of the 259 cases (58%), the CEOs' classifications of the strategies of two years past differed from their earlier classifications. For example, 165 CEOs reported at time 1 that their hospitals were currently most similar to the analyzer type. Two years later, the same CEOs reported their strategy of two years ago to have been the following: defender, 48; analyzer, 88; prospector, 17; and reactor, 12. Time 2 responses that agree with the validated time 1 strategy measure are indicated by the boldface figures on the diagonal in Table 1.

The question remains, Which of the responses were "wrong"—those on the current measure, the retrospective measure, or both? As noted, Shortell and Zajac (1990) demonstrated that the time 1 strategy assessment procedure was valid in that the assessments obtained using the procedure were strongly associated with strategies assessed on the basis of archival data. Therefore, the current findings indicate substantial retrospective errors, not errors in reporting strategies during the first phase of data collection. Since

TABLE 1
Frequency Data[a]

Strategic Types	Reported Time 1 Strategy	Time 1 Strategy Reported at Time 2					
		Defender	Analyzer	Prospector	Reactor	*N*	%
Defender	6	**4**	1	0	1		
Analyzer	165	48	**88**	17	12		
Prospector	47	7	23	**13**	4		
Reactor	41	10	24	3	**4**		
Totals	259	69	136	33	21		
Total agreements						109	42
Total disagreements						150	58

[a] Boldface figures indicate the number of hospitals for which the retrospective accounts agreed with the original accounts.

I could not establish the reliability of the retrospective reports, it is not necessary to fully report the results from the validity checks.[2]

DISCUSSION

On the basis of a variety of arguments from cognitive and social psychology (Fischhoff & Beyth, 1975; Tedeschi & Melburg, 1984) and organization theory (Dutton & Duncan, 1987; Feldman & March, 1981; Huber & Power, 1985), researchers have speculated that CEOs may (1) be systematically unable to recall firms' previous strategies, because of the minimal salience of the strategies, or (2) be motivated not to do so because of concerns related to impression management. However, it had not been established that the phenomenon of retrospective errors was real and significant. The findings in this study indicate that retrospective errors may be pervasive; nearly 60 percent of the retrospective accounts studied here did not agree with validated reports elicited only two years earlier.

Correlates of Reporting Errors

The data presented in Table 1 allow speculation about the patterns and causes of retrospective errors. For example, the retrospective errors appear to be in the direction of describing past strategies as more similar to the defender strategy than either the archival data or the previous strategy assessments suggest is justified. Although it is not possible to draw definitive conclusions from these patterns, the data indicate that recent industry changes may have influenced the CEOs who erroneously reported their past strategies. Specifically, the Medicare Prospective Payment System, introduced by the federal government in 1983, determined precise reimbursement levels for specific services; reimbursement levels were set regardless of a particular hospital's costs. Previously, all hospitals had been reimbursed on a cost-plus basis. Thus, once this system was fully implemented, hospitals had a new and significant incentive to minimize costs—efforts characteristic of Miles and Snow's archetypal defender (Hambrick, 1982).

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[2] Despite my inability to establish the reliability of the retrospective reports, I performed analyses of variance to try to determine the reports' discriminant validity. As expected, these analyses, which were procedurally identical to Zajac and Shortell's, indicated that the retrospective reports could not discriminate the actual hospital behaviors (numbers of new services offered or developed).

In an effort to gain further insight into the possible correlates or causes of the retrospective errors, I offer brief additional speculations on two questions: (1) Do retrospective errors occur systematically or randomly? and (2) Are such errors systematically related to certain organizational or contextual factors? First, as suggested, hospital executives may view the defender stance as the most attractive strategy, given industry changes in 1983. Therefore, recall may have been biased in favor of reporting a time 1 defender strategy. Second, strategic change may affect recall, though the direction of this effect is difficult to predict. Because strategic change can be particularly disruptive and resource-intensive (Pennings, 1985), it can be argued that change enhances the salience of past strategy. In contrast, managers involved in the strategic change process may attempt to disavow past strategies since the impetus for change is often a reaction to a performance gap (Dutton & Duncan, 1987), which may indicate to managers that the earlier strategy was inappropriate. Third, past performance is likely to be positively associated with retrospective accuracy as CEOs of poorly performing firms may, consciously or otherwise, deny their past decisions. Fourth, since organizational performance lags previous strategic decisions, it is also necessary to investigate the expected positive relationship between present performance and retrospective accuracy. Fifth, I would expect a CEO's involvement in the strategic planning process to be positively associated with the CEO's awareness of past strategy, and therefore, with accurate recall. Finally, previous researchers (Huber & Power, 1985; O'Reilly, 1978) have suggested that CEO demographic characteristics may be associated with accurate recall. For instance, CEOs with formal business educations, such as those who have M.B.A. degrees, may be expected to more accurately recall past strategy than those without such educations. Also, the length of employment by an organization may be positively associated with accurate recall, since individuals with long tenures may have a greater awareness of their firms' strategies than those with shorter terms; they may also assume greater job security and therefore have less incentive to misrepresent past strategic decisions. I explored each of these speculative propositions in a logistic regression analysis; results appear in Table 2. Appendix B defines the measures.

Table 2 presents several interesting, though tentative, findings regarding the conditions under which retrospective accounts are most accurate. First, retrospective accuracy, or agreement between the contemporaneous and retrospective strategy responses, appears to be affected by past strategy. The

TABLE 2
Results of Logistic Regression Analysis[a]

Independent Variables	b	s.e.	Wald Statistic	R
Past strategy				
Defender	1.04	0.95	1.19	.00
Prospector	−1.54***	0.46	12.07	−.18
Reactor	−2.74***	0.77	12.66	−.19
Strategic change	−0.58**	0.22	6.70	−.13
Centralization	−0.04	0.06	0.52	.00
Current profitability	0.60†	0.39	2.41	.04
Past profitability	−0.16	0.37	0.20	.00
CEO business education	−0.15	0.36	0.17	.00
CEO years in organization	−0.00	0.04	0.01	.00
Constant	0.10	1.28	0.01	

[a] The correlation matrix is available upon request.
† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

CEOs of hospitals identified as either prospectors or reactors in 1984 were more likely than the 1984 analyzers' CEOs to erroneously report past strategies in 1986 ($p < .001$).[3] The coefficient for the defender category is not statistically significant, though it should be noted that there were only six reported defenders in 1984. Second, CEOs whose hospitals experienced the greatest strategic change over the two-year period were the most likely to report past strategies inaccurately ($p < .01$). Third, current profitability is marginally and positively associated with retrospective accuracy ($p < .10$). In other words, CEOs with relatively poor current profitability were the most likely to misrepresent their organizations' past strategies. This finding is consistent with both the cognitive biases and image enhancement arguments advanced earlier. The exploratory analysis did not reveal any significant association between retrospective accuracy and past performance, the degree of centralization characterizing the relationship between a hospital and its corporate staff, or the CEO demographic data.

The apparent patterns of retrospective errors are understandable in the context of research on both cognitive biases (Nisbett & Wilson, 1977) and image enhancement behaviors (Feldman & March, 1981; Salancik & Meindl, 1984). Given the increasing competition and consolidation occurring in the hospital industry (Shortell, Morrison, & Friedman, 1990), as well as institutional pressures (cf. Scott, 1987) to rationalize the delivery of health services, CEOs seem to have responded at the time of the retrospective assessment in such a way that their strategy assessments were consistent with norms of "expected rationality" (Thompson, 1967); in this industry, such norms encouraged a shift from the reactor and prospector strategies and toward the presumably more efficient analyzer and defender strategies (Shortell et al., 1990).

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[3] For large groups, the test that a coefficient is 0 can be based on a logistic regression equation's Wald statistic (Hosmer & Lemesmow, 1989), which has a chi-square distribution. Generally, a Wald statistic greater than 2 indicates significance at the .05 level or better. The partial correlation between the independent and dependent variables can range from −1 to +1; here, a positive value indicates that as the value of the variable increases, so does the likelihood of agreement between the two strategy accounts.

Moreover, the finding regarding the influence of recent strategic change on CEO retrospective accuracy suggests that the effect of a respondent's memory, as opposed to the respondent's cognitive biases or intentional misrepresentation of the past, must also be acknowledged. Specifically, although strategic change may highlight the salience of past events, it likely brings with it a good deal of uncertainty and confusion. Thus, both strategic change and turbulence in the hospital industry may have exacerbated the inherent problems of retrospective data.

Strategies for Reducing Errors in Retrospective Accounts

If retrospective errors are common and systematically associated with some organizational and contextual characteristics, it is important to consider issues concerning the reduction of retrospective errors. In general, the current findings partially support the proposition that CEOs may indeed posture to cast past decisions in the most favorable light. Thus, it should first be emphasized that the content of all retrospective data is not alike. Retrospective accounts of past facts or behaviors are likely to be more accurate than accounts of past beliefs and intentions, which are more subjective and perhaps more vulnerable to the effects of cognitive biases and faulty memory. A related issue is the appropriateness of the data collection procedure used here. A CEO's assessment of a firm's strategy is necessarily subjective, and the strategy phenomenon is inherently complex and ambiguous. The data collection procedure was acceptable for eliciting reports of current strategy (cf. Shortell & Zajac, 1990), but those qualities of strategy may pose substantial measurement problems when a CEO is asked to recall past strategy.

Second, researchers must acknowledge respondents' possible emotional attachment to such strategic concerns as pet projects with which they are publicly associated, and their more general interest in portraying a particular view of their organizations. Respondents' organizational roles may also influence their interpretations of the past (Dearborn & Simon, 1958). One implication of this likelihood might be the value of relying on multiple respondents in an organization. This commonly advocated approach (e.g., Schwenk, 1985) may present unique difficulties for strategy researchers, however, since strategic awareness appears to be positively related to hierarchical level (Hambrick, 1981). Thus, the benefit of using multiple respondents has to be balanced against the possibility of introducing greater systematic error into the measurement of certain phenomena.

Third, the inherent incentives and disincentives for participating in a research program must be recognized in the design of a study. Managers should be adequately motivated not only to participate in a study, but also to provide accurate information. For example, a researcher might provide CEOs with information about how other firms in their industry have attempted to implement particular strategies. Such feedback of course will be most useful when a CEO helps the researcher to assess an organization accurately.

Fourth, my exploratory finding that strategic change is negatively associated with accurate recall and the research setting of the study indicate that organizational and industry contexts may influence the quality of retrospective data. Under conditions of recent strategic change, it may be substantially more difficult than it would be otherwise for a CEO to recall what a firm's strategy was at any particular point in time. Thus, if precisely dating a past strategy is important, researchers should be wary of relying on retrospective data gathered shortly after recent organizational changes. Fifth, and more generally, the discussion and findings indicate the need to rely not only on multiple respondents where possible, but also to seek multiple forms of data, including retrospective, archival, and longitudinal data. Such "triangulation" (Jick, 1979) may both allow for the validation of each data source and also enrich a researcher's interpretation of the data (Schwenk, 1985).

Limitations

The current findings should be considered in the context of the study's limitations. First, caution should be used in interpreting the more tentative findings suggested by the logistic regression analysis. Specifically, using the same respondents and the same questionnaire to obtain data on the predictor and criterion variables may have introduced some common method bias. Given these facts, the tentative conclusions drawn from Table 2 must be treated with considerable caution and regarded primarily either as speculations about what might be or as the bases for hypotheses to be tested in the future. Second, alternative strategy classification schemes other than the one used here may have revealed different levels of retrospective accuracy.

Third, this research is limited by its intended scope. Since this study focused only on CEOs' retrospective accounts of past strategy, the findings may not be generalizable to people in other organizational positions or to accounts of other types of decisions and behaviors. Although this study tested a manager's ability to recall and report past strategy accurately, the subjectivity inherent in characterizing strategy suggests that researchers ought to avoid concluding that the retrospective account methodology should be categorically dismissed from future consideration. Finally, it should be noted that the empirical context of this study was highly turbulent and competitive during the study period. Thus, it remains to be established whether the frequency of CEO retrospective errors found here is independent of, or a function of, environmental conditions.

Final Comments

Although this study was not able to determine the fundamental causes of errors in retrospective assessments, it indicated that retrospective errors are common and suggested some conditions under which they may be most prevalent. The next steps in this line of inquiry should involve determining the pervasiveness of the error phenomenon across both tasks and position holders, as well as the further empirical investigation of the determinants of retrospective errors. The latter should include investigating both the potential determinants discussed previously and others. For example, does the frequency of strategic change diminish a CEO's ability to recall events from particular moments in the past? Do top management characteristics affect retrospective accuracy? What effect does the length of time elapsed between an event and the recollection of that event have on retrospective accuracy? Is there an interaction between the length of time and the content of the issue to be recalled? Though beyond the scope of this paper, the answers to these and other questions, and to the more general question of whether retrospective errors are systematic or random, have important implications for management researchers. If retrospective errors occur systematically, they are by implication controllable.[4] Where they are not, researchers should be willing to either pursue alternative data sources or acknowledge and clearly report the weaknesses of their data.

In conclusion, future researchers evaluating the merits of the retrospective accounts methodology should also consider expanding their foci to other industry contexts and to other types of decisions and behaviors. Given both the results of this study and the expectation that CEOs will be more aware of firm strategies than other informants (Hambrick, 1981), the use of retrospective accounts in management research needs to be seriously questioned. For those who have used or intend to use this methodology, this study underscores the value of a healthy dose of skepticism in the study design stage, and ultimately, in the interpretation of retrospective data.

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[4] See Huber and Power (1985) and Schwenk (1985) for extensive theoretical and prescriptive treatments of this issue for strategy research.

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APPENDIX A
Strategy Types

"*Hospital* A occupies a 'niche' in the health care system by offering a relatively stable set of services to defined markets. Generally, Hospital A is not at the forefront of new services or market developments in health care. It tends to ignore changes that have no direct impact on current areas of operation and concentrates instead on doing the best job possible in its existing arena.

"*Hospital* B maintains a relatively stable base of services while at the same time developing selected, promising new services and markets. The hospital is seldom first to provide new services or expand into new markets. However, by carefully monitoring the actions of institutions like Hospital C (below), Hospital B attempts to follow with a more cost-effective or well-conceived service.

"*Hospital* C makes relatively frequent changes in and additions to its set of services and markets served. It consistently attempts to be first to provide new services or develop new markets, even if not all of these efforts ultimately prove to be successful. Hospital C responds rapidly to early signals of market need or opportunities.

"*Hospital* D operates like all three hospitals above (A, B, and C) at different times, and therefore cannot be clearly classified in terms of its approach to changing its services or markets. It does not have a consistent response to market changes. At times, the hospital will not make service/market changes unless forced to by external events (like Hospital A); at times, it will move into new fields only after considerable evidence of potential success (like Hospital B); and at other times, it will be an early entrant into new fields of opportunity (like Hospital C)."

The 1984 strategy measure was as follows: "Please rate (circle) the number which best reflects how your hospital **now operates** along the seven-point continuum (or indicate Hospital D as most like your hospital)."

A B C Hospital D
1 2 3 4 5 6 7

The 1986 measure was the same except that "operated two years ago" replaced "now operates."

APPENDIX B
Regression Analysis Variables

Strategic change was the absolute difference between the validated 1984 strategy and the 1986 strategy measures, using the four nominal categories (cf. Shortell & Zajac, 1990). CEOs did not indicate change but assessed strategy at two points of time using the validated instrument. *Past and current profitability* were based on CEO reports of the profitability of 15 selected services and validated for a subgroup of hospitals for which complete and reliable profit margin data were available ($p < .001$) (Zajac & Shortell, 1989). CEO involvement in the planning process was indicated by the *degree of centralization* characterizing a corporate-SBU relationship and was measured with a nine-item index indicating the extent to which hospital management had the authority to make each of nine strategic decisions (e.g., identifying emerging markets; Golden, 1992). Responses were reported on a three-point scale (hospital level = 1, regional/divisional = 2, corporate = 3). I partially validated this measure by examining the relationship (expected to be negative; Meyer, 1972) between centralization and corporation size. In support of the partial validity of this measure, the bivariate correlation was significant and negative ($r = -.16$, $p < .025$). CEO *business education* was represented by a dichotomous variable (1 = M.B.A., 0 = no M.B.A.). *Years in organization* was simply the number of years a CEO had been employed in the current hospital. Finally, the dependent variable was coded 1 for agreement between the time 1 and time 2 categorical strategy assessments and 0 for disagreement.

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THE EFFECTS OF EMPLOYEE INVOLVEMENT PROGRAMS ON UNIONIZED WORKERS' ATTITUDES, PERCEPTIONS, AND PREFERENCES IN DECISION MAKING

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This research examined differences in perceptions and attitudes regarding work, the union, and preferences for decision-making structures among three groups: participants and nonparticipants in an employee involvement program, and employees who had volunteered for the program but had not yet had the opportunity to participate. Results indicated that the volunteers generally had the most positive attitudes toward their work and union; participants showed the greatest disparity between their perceived and desired levels of influence. Participants also viewed employee involvement as the best structure for decision making on some work issues; nonparticipants favored collective bargaining.

Employee involvement programs are increasingly being implemented in an attempt to remedy a variety of problems facing U.S. industry. According to anecdotal accounts in management periodicals, the promise of employee involvement is far-reaching and includes improvements in labor productivity, enhanced product quality, stronger employee motivation, positive changes in employee attitudes, and better employer-employee relations (cf. Blinder, 1989; Hoerr, 1989; Lansing, 1989).

Management theorists and researchers have long promoted the concept of employee involvement in decision making, beginning with the Hawthorne experiments of the 1920s. In employee involvement, as well as in other participation programs, positive changes in employee attitudes and behavior are said to be realized through a process of involving employees in aspects of decision making that have been traditionally reserved for management. According to theory, this inclusion of employees is intrinsically rewarding in that it provides them with a greater sense of ownership or involvement in their work and a better understanding of both how their work can be done most effectively and management's perspective on the operation of the business (cf. Leana & Florkowski, 1992; Locke & Schweiger, 1979). Thus, employee involvement is thought to benefit the employee as well as the employer.

The effects of employee involvement on unions has also received recent attention. Traditionally, management has initiated employee involvement, and it was initially resisted by many unions (and continues to be by some) because it was thought to erode support for unions and encroach upon their traditional role as the representative of employee concerns (Perline & Poynter, 1989). Recent restructuring in U.S. industries and the associated diminishing of job security, however, have convinced many union leaders that employees and their unions must be far more actively involved than they have been in making decisions previously reserved for management (Banks & Metzgar, 1989; Rubenstein, 1987).

THEORETICAL FRAMEWORK

Recent reviews of the accumulated research on employee participation programs have been consistent in their conclusions regarding the effects of participation on work-related attitudes. Employee involvement in decision making has been positively associated in numerous studies with attitudes such as job satisfaction and organizational commitment (Miller & Monge, 1986; Schweiger & Leana, 1986; Wagner & Gooding, 1987). The theoretical rationale for these relationships is that participation promotes feelings of independence, influence, and esteem among employees, which in turn enhance morale and commitment (Locke & Schweiger, 1979).

Employee attitudes toward a union may also be associated directly with employee involvement, or viewed as a consequence of changes in employees' work attitudes. Some unionists have voiced concern that improved attitudes toward management as a result of employee involvement will erode union commitment. Verma's (1989) work concentrated on two potential mechanisms by which employee involvement programs might affect union attitudes. First, such programs may attract employees less interested than others in unions and thus structurally divide employees into pro- and anti-union camps. Verma labeled this phenomenon a "selection effect," since correlations between program participation and union attitudes are attributed to self-sorting based on differences among employees that predate the employee involvement program.

Verma labeled the second way that employee involvement participation may be associated with changes in union attitudes a "program effect." As stated previously, numerous studies have suggested that the experience of participation in an employee involvement program may enhance employees' positive attitudes toward their jobs and employing organizations. A decrease in union allegiance may accompany those positive attitudes, particularly if the union was not involved in the design and implementation of the employee involvement program (Verma & McKersie, 1987).

Positive attitudes toward a company, however, need not be associated with negative ones toward a union. The research on dual loyalty models of commitment indicates that individuals can simultaneously hold positive attitudes toward their unions and their employers (Dean, 1954; Purcell, 1960). More recently, Angle and Perry (1986) and others (e.g., Martin, 1981) have suggested that the degree of cooperation between management and labor may influence the ability of employees to maintain dual loyalty. Employees may have some difficulty maintaining dual allegiance to a union and management that are in conflict, but they are able to maintain commitment to both parties when the two have cooperative relations. Research on employee involvement programs and union involvement has supported this general finding (e.g., Thacker & Fields, 1987; Verma, 1989).

A more specific issue that may be of some concern to both companies and unions is the effect of an employee involvement program on employees' attitudes toward collective bargaining, the traditional union process for involving employees in decision making. Following Verma's (1989) framework, we propose a third, more specific, potential effect of employee involvement, which we label a "displacement effect," or the potential of employee involvement programs to displace collective bargaining as unionized workers' preferred structure for participating in decisions about work-related issues. Although American labor law compels collective bargaining for many decisions concerning employment relations, union member support for the process—and, by implication, for the union—may nonetheless be influenced by the presence of other decision-making structures, such as an employee involvement program.

In the research reported here, we examined several issues regarding the effects of employee involvement programs on employee attitudes and perceptions, and the bases for those effects. First, we examined potential differences between employee involvement program participants and nonparticipants in their attitudes toward their company and their jobs. The literature on the effects of participation on employee work attitudes suggests that attitudinal changes are largely attributable to the participation experience itself (Leana & Florkowski, 1992; Locke & Schweiger, 1979) and consequently, the production of such changes can be described as a program effect. We predicted the following:

> *Hypothesis 1: Employees actively involved in an employee involvement program will have more positive attitudes toward their work and employer than will nonparticipants or volunteers—employees who wish to participate in an employee involvement program but have not yet had the opportunity to do so.*

Second, we wished to extend Verma's work on the effects of participation in an employee involvement program on union attitudes and to examine the dual commitment model. Verma's research suggests that when a union is active in structuring an employee involvement program, employees will not be divided into pro- and anti-union camps (selection effect), nor will participation in an employee involvement program erode union attitudes (program effect). In fact, participation in the program may enhance both company and union attitudes (Verma, 1989). Thus we predicted the following:

> *Hypothesis 2: When there is high union involvement in the design and implementation of an employee involvement program, employees participating in the program will have more positive attitudes toward their union than will nonparticipants and volunteers.*

Third, we examined the effects of an employee involvement program on employees' perceived and desired levels of influence in decision making. Some writers have touted increased influence in decision making as one of the primary benefits of employee involvement to employees, and as one of the primary reasons for instituting such programs (Lawler, 1986; Sashkin, 1984). Although there may be variability among employee involvement programs in the amount of real influence employees are actually permitted, program participants should nonetheless perceive themselves as having more influence than nonparticipants since they are in fact engaged in a process meant to foster those perceptions. We predicted the following:

> *Hypothesis 3a: Employee involvement program participants will report more perceived influence in decision making than will nonparticipants and volunteers.*

In addition to this program effect, we also predicted a selection effect: If enrollment in an employee involvement program is voluntary, presumably it will attract interest from employees whose desire for influence is greater. Thus, we predicted:

> *Hypothesis 3b: Employees indicating interest in a voluntary employee involvement program—both participants and volunteers—will report greater levels of desired influence than nonparticipants.*

The final issue our research addressed centered on a potential displacement effect that employee involvement may create. Participants may see employee involvement as an attractive alternative to making decisions through collective bargaining, particularly if they view the employee involvement program as a means of increasing their influence in decision making. Thus, we predicted:

> *Hypothesis 4: Program participants will be more likely than nonparticipants to view employee involvement as a desirable structure for decision making. Nonparticipants will be more likely to favor the more traditional decision-making structures—collective bargaining and management acting alone without employee input.*

METHODS

Research Site

The research site was a medium-sized steel manufacturer with approximately 600 employees. A large industrial union represented all hourly employees. We chose the research site because it was typical of many integrated steel producers, and the working conditions in the plant and the character of labor-management relations were similar to those in many other heavy industries. The research site was also attractive because of the characteristics of its employee involvement program. It is not uncommon for employee involvement to enjoy a honeymoon period, which is later replaced by a period during which program outcomes are less positive but more stable. In addition, both empirical research and numerous case studies have suggested that successful implementation of an employee involvement program depends on the commitment of both management and labor (Leana & Florkowski, 1992). At the time of this study, the employee involvement program at the site had been in place for about two years, and the employee involvement teams had been in operation for a year. In addition, both management and union officials were involved in the program's design and implementation.

A company-wide steering committee made up of an equal number of representatives of management and labor directed the program. Two plant advisory committees reported to the steering committee. The steering committee was responsible for making policy decisions and for approving the projects recommended by the plant committees. The plant advisory committees, consisting of union and management representatives, identified the projects the employee involvement teams would work on and facilitated the creation of the teams; the teams were largely made up of hourly employees although one or two salaried employees, typically direct supervisors, were also included on each team. The salaried employees participated as regular members of teams and had no special role or leadership responsibilities.

In its initial implementation, both union and management purposely limited the number of employee involvement teams in order to iron out any problems that might arise before the program was more widely adopted. By late 1990, eight teams had been formed, involving approximately 20 percent of the company's work force. Teams had an average of 12 participants, with membership ranging from 10 to 15. Projects undertaken by the teams focused on such issues as safety, material usage, paper recycling, and material flow.

Participation in the employee involvement program was voluntary. The teams met weekly after work; hourly employees were paid overtime for their participation. The teams did not share directly in cost savings generated by their projects. However, the company had a profit-sharing system based on company-wide performance goals that, over the previous year, had provided approximately 30 percent of the hourly employees' total compensation.

Procedures

Data were collected through questionnaires distributed to all hourly employees during work hours. Each questionnaire packet contained a copy of the questionnaire; a cover letter, signed by both a management representative and the local union president, that encouraged employees to complete the questionnaire; and a return envelope. All hourly employees received packets at the end of their work shifts and were instructed to complete and return the questionnaires by the following day. The overall response rate was 65 percent. Employees participating in the employee involvement program had a slightly higher response rate (72%) than those who were not participating (63%). All data were collected in fall 1990.

Respondents

Respondents were 351 hourly employees; 95 percent were men and 87 percent were Caucasian. All but 6 percent had graduated from high school, and 40 percent had some post-secondary education. In large part because of high levels of overtime work, respondents' average annual earnings were quite high. Over half (58%) had earnings (including overtime and profit-sharing) of over $50,000 per year, with a range of from $50,000 to $55,000 annually. The average range of tenure with the company was from 11 to 15 years. According to company officials, our respondent demographic profile matched the profile of employees as a whole.

There were 67 current participants in the employee involvement program; 112 volunteers, or employees who were not currently participating but who indicated they would like to in the future; and 172 nonparticipants, or employees who were not interested in participating in the program. The only significant difference in demographic characteristics among the three groups was educational level. Participants and volunteers were somewhat more likely than nonparticipants to have some post-secondary education.[1]

Instrumentation

Work attitudes. Satisfaction with supervision and global job satisfaction were measured using items from Hackman and Oldham's (1975) Job Diagnostic Survey. Both constructs were measured on seven-point scales (αs = .89 and .63, respectively). We measured job involvement using four items from Lodahl and Kejner's (1965) measure, with respondents indicating their level of agreement on seven-point scales ($\alpha = .73$). Organizational commitment was assessed with Porter and Smith's (1970) 15-item Organizational Commitment Questionnaire ($\alpha = .76$).

Attitudes toward the union. We measured two aspects of union commitment using Gordon, Philpot, Burt, Thompson, and Spiller's (1980) scale.

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[1] Because of the group differences in educational level, we conducted all analyses both with and without educational level entered as a covariate. The results of these sets of analyses were comparable, so we report only analyses without educational level (Table 1). Because there were differences in the number of respondents in each group, we also analyzed the data with a random sample of volunteers and nonparticipants equal to the number of participants ($N = 67$ for each group). Again, the results were comparable to those reported in Table 1.

Loyalty to the union was assessed by 10 items (α = .77), and belief in unionism by 3 items (α = .71). We also asked respondents to indicate their level of satisfaction with various aspects of the union: overall satisfaction, satisfaction with the local leadership, satisfaction with the international union, and satisfaction with the level of service they received from the union; measures were single items with five-point scales.

Influence in decision making. Respondents were asked to consider 24 work-related issues, such as the way the work was done and how complaints were handled, and rate each in terms of (1) how much influence they currently had in making decisions on that issue and (2) how much influence they would like to have. Influence was assessed on four-point scales with anchors ranging from 1, "none at all," to 4, "a lot." We calculated average influence scores for both current and desired influence; alphas were .91 and .93, respectively. We also calculated a difference score for each respondent by subtracting the current influence score from the desired influence score.

The 24 issues were grouped into four categories: (1) traditional management concerns, or strategic matters and other issues traditionally decided by management alone, such as management salaries or the way the company invests its profits; (2) issues that deal with the quality and/or efficiency of work processes, such as how the work is scheduled and completed; (3) issues concerning interactions within work groups, such as who is hired and how jobs are assigned; and (4) bread-and-butter issues, such as safety, pay, and benefits. We adopted many of the issues and their categorizations from previous studies of employee involvement (e.g, Kochan, Katz, & Mower, 1984).

Structure for decision making. Respondents were also asked to indicate their preferences in terms of the structure used to make decisions about each of the 24 issues. The choices were (1) the employee involvement program, (2) collective bargaining between management and the union, and (3) management acting alone, without employee input. At the time of the study, all bread-and-butter issues and most quality and efficiency concerns were handled through collective bargaining. Management generally made all decisions on issues in the categories of traditional management concerns and work group issues and on any issues not covered under collective bargaining. The employee involvement program generally was not a forum for making decisions on any of the 24 issues except for a few that fell under the category of quality and efficiency concerns such as safety or material handling issues.

RESULTS

Table 1 shows the results of multivariate and univariate analyses of the effects of level of participation in the employee involvement program on employee attitudes, perceptions, and preferences. The independent variable,

TABLE 1
Mean Scores and Analyses of Variance Results[a]

Variables	Highest Possible Rating	Means[b]			*F*
		Participants	Volunteers	Nonparticipants	
Work attitudes					
Job satisfaction	7	5.71	6.09	5.92	1.84
Job involvement	7	6.75	6.76^1	6.45^1	3.47*
Satisfaction with supervision	7	4.66^1	5.50^1	5.30	3.08*
Organizational commitment	7	5.75	5.90^1	5.56^1	3.74*
Union attitudes					
Loyalty	5	3.26	3.39	3.31	1.77
Belief in unionism	5	3.05	3.30	3.39	2.18
Satisfaction					
Overall	5	3.22	3.44^1	3.21^1	3.19*
With local	5	3.31	3.35	3.19	1.51
With international	5	2.84	2.93	2.77	1.33
With service	5	3.24	3.57	3.64	2.80
Influence in decision making					
Desired	4	2.81	2.74	2.61	2.29
Current	4	1.47	1.55	1.56	0.94
Frustration index	3	1.34^1	1.19	1.05^1	3.99*
Decision-making structure					
Employee involvement	24	6.21^2	5.96^1	$3.66^{1,2}$	3.86**
Traditional management	6	1.45^2	1.27^1	$0.62^{1,2}$	10.35***
Quality-efficiency	7	2.48^2	2.39^1	$1.62^{1,2}$	6.18***
Work group	2	0.73^1	0.55	0.37^1	6.48**
Bread and butter	9	1.61	1.79^1	1.14^1	3.35*
Collective bargaining	24	10.51	10.81	12.12	1.62
Traditional management	6	1.33^1	1.71	1.95^1	3.34*
Quality-efficiency	7	2.96	2.84	3.11	0.73
Work group	2	0.67^1	0.77	0.93^1	3.01*
Bread and butter	9	5.91	5.68	6.07	0.73
Management acting alone	24	6.28	5.85	7.07	1.13
Traditional management	6	2.90	2.66	3.17	2.47
Quality-efficiency	7	1.66	1.36	1.73	1.03
Work group	2	0.48	0.56	0.61	0.85
Bread and butter	9	1.12	1.13	1.38	1.20

[a] $N = 351$; participants = 67; volunteers = 112; nonparticipants = 172.

[b] Common superscripts indicate that row means are significantly different on the basis of Tukey HSD tests ($p < .05$).

* $p < .05$

** $p < .01$

*** $p < .001$

participation in employee involvement, had the three levels previously described: participant, volunteer, and nonparticipant. Significant differences between participants and volunteers would suggest variance attributable to the employee involvement experience, a program effect. Significant differences between nonparticipants and volunteers would suggest a selection effect not attributable to the employee involvement experience.

As Table 1 indicates, work attitudes were not more positive for participants than for nonparticipants; in fact, participants reported the lowest levels of job satisfaction and satisfaction with supervision. The multivariate effect for level of participation was statistically significant ($F = 2.97$, $p < .01$). Univariate effects were significant for job involvement, organizational commitment, and satisfaction with supervision. In examining the post hoc comparisons in cases in which the univariate F-test showed significant differences among the three groups (Tukey HSD test), we found that volunteers showed significantly greater levels of job involvement and organizational commitment than nonparticipants. Moreover, volunteers were significantly more satisfied with their supervisors than were participants.

The only significant difference in union attitudes among the three groups was on the one-item measure of overall satisfaction with the union. The post hoc comparison of means indicated that volunteers had significantly higher levels of satisfaction than nonparticipants.

The multivariate test for the level of influence employees perceived themselves to have and the level of influence they desired yielded a marginal effect for participation group ($F = 2.01$, $p = .09$). Univariate tests were not significant for current influence and only marginally significant for desired influence ($p = .10$). Although these differences were not statistically significant, participants did have significantly greater difference scores than nonparticipants. We labeled this score the "frustration index." The participant-nonparticipant difference on this index was the combined result of participants having the greatest levels of desired influence and, unexpectedly, the lowest levels of perceived influence. This finding suggests that the employee involvement experience may have the effect of both raising participants' aspirations for influence and, at the same time, lowering their perceptions of the level of influence they actually have. Since the frustration indexes for participants and volunteers were not significantly different, however, it is not possible to rule out the operation of a selection effect. Those employees perceiving the greatest discrepancy in actual and desired influence may have been the most likely to want to be involved in the employee involvement program.

Table 1 shows the results of multivariate analyses of variance examining differences among participants, volunteers, and nonparticipants in their overall preferences for decision-making structures, as well as the results of the corresponding univariate tests examining differences in group preferences concerning each of the four categories of decisions. As indicated in the table, the three groups differed primarily in terms of how much they thought employee involvement should be used to make decisions. Overall, selection of employee involvement as a preferred decision-making structure was positively and linearly related to employees' level of participation in the program: employee involvement participants selected it with the greatest frequency, followed by volunteers; nonparticipants selected it with the least frequency. The relationships within categories of decisions followed this general trend, with participants selecting employee involvement with significantly greater frequency than either volunteers or nonparticipants for traditional management decisions, issues involving work groups, and quality and efficiency concerns. Volunteers selected employee involvement with the greatest frequency for decisions on bread-and-butter issues.

Overall, preferences for collective bargaining or management acting alone were not significantly related to level of participation, although the trends in both cases indicate that nonparticipants were the most likely to select both collective bargaining and management alone. Although these overall trends were not statistically significant, nonparticipants were significantly more likely than participants to prefer collective bargaining in two of the decision categories: traditional management decisions and decisions concerning work groups. There were no significant differences among the groups in the frequency with which they selected management acting alone for decisions concerning quality, work groups, or bread-and-butter issues, although a marginally significant difference was observed for traditional management issues ($p < .10$).

DISCUSSION

Our research provides evidence that both supports and contradicts previous work on employee involvement's potential effects. In terms of work-related attitudes, the employee involvement volunteers studied here—not the participants—reported more positive attitudes toward their company, jobs, and union than did nonparticipants. Thus, employees' interest in the program, rather than their actual participation in it, was more strongly associated with attitudinal differences among the groups. This finding does not support our initial hypotheses concerning a program effect (Hypotheses 1 and 2); instead, the volunteers' reporting more positive work attitudes than the other two groups provides partial support for a selection effect interpretation of these data.

The failure to find effects attributable to involvement in the program is at odds with several previous studies of employee involvement and much of the theory on participative decision making. Essentially, the employee involvement program did not seem to capitalize on the positive attitudes present among volunteers prior to their entry into it. This failure may be due to several factors; one that seems most evident concerns the higher frustration index reported by employee involvement participants. Compared to nonparticipants, program participants reported greater differences between the level of influence they would like to have in decision making and the level they perceived themselves to have. Although we expected that participation in the employee involvement program would encourage employees to want more influence in decision making (Hypothesis 3b), we also expected perceived influence to rise (Hypothesis 3a). That this relationship was not found signals that the program may not be living up to its promise in the eyes of participants because it does not permit employees to exercise their enhanced desire for influence; in addition, it may arm them with information and knowledge that enable them to see how little influence they actually have. Although we were not able to directly test these speculations from the cross-sectional data collected here, participants' frustration may also help to explain the failure of employee involvement to enhance work-related attitudes.

Third, despite these troubling aspects of the program, participation in employee involvement was associated with greater support for such programs as a preferred decision-making structure (Hypothesis 4). This finding may indicate that despite current frustrations, participating employees nonetheless saw the potential of employee involvement. Moreover, in our study this preference for employee involvement came at the expense, on some issues, of a preference for collective bargaining, suggesting that there may have been something of a displacement effect at work.

The possibility of a displacement effect may be of some alarm to union officers concerned about the erosion of support for the collective bargaining process. In interpreting our findings, however, it is important to keep in mind both the study methodology we used and the types of decisions in which significant differences were found. First, in our research, employee involvement, collective bargaining, and management acting alone were presented to employees as mutually exclusive decision-making strategies. In reality, employee involvement, collective bargaining, and management prerogative coexist comfortably in many organizations (cf. Rubenstein, 1987).

Second, it is important to underscore that involvement in the program did not affect selection of collective bargaining as the preferred decision-making mechanism for bread-and-butter concerns such as pay and benefits; quality and efficiency concerns were similarly unaffected. The issues affected were largely those that have been traditionally decided by management alone, such as investment and strategic decisions. In those cases, employee involvement participants shifted their preferences from management prerogative to employee involvement, and nonparticipants shifted to collective bargaining. Moreover, overall satisfaction with the union—the only significant union-related attitudinal difference among the three groups—was approximately the same for participants and nonparticipants; volunteers reported the highest level of union satisfaction. This finding again underscores the effects of self-selection: favorable attitudes appear to be antecedents rather than consequences of employee involvement in decision making.

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MEASUREMENT OF FIRM DIVERSIFICATION: IS IT ROBUST?

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This study investigated the convergent validity of Rumelt's categorical classification of types of business diversification across different data sources and variations from Rumelt's method. The study also assessed convergent and predictive validity of Rumelt's classification and continuous measures of diversification. It also investigates the ability of continuous measures to discriminate between Rumelt's categories. The results suggest weak convergent validity for Rumelt's measures but good discriminating power of continuous measures to discriminate between Rumelt's measures. Finally, the measures demonstrate predictive validity with specific performance criteria.

A controversial research question in the strategic management discipline concerns the positive association between related diversification and performance originally observed by Rumelt (1974). However, lost in the debate about the validity of the relatedness hypothesis is Rumelt's main contribution to the diversification literature: "a carefully conceptualized categorical measure of diversification, [by which] Rumelt was able to demonstrate a link between diversification and performance which other researchers using simpler measures of diversification had not been able to show" (Montgomery, 1982: 299). Rumelt classified firms into four types of diversification categories: single-business, dominant-business, related-diversified, and unrelated-diversified. Although researchers are still using Rumelt's measures (Lubatkin & Chatterjee, 1991), the diversification literature has increasingly seen the use of other measures of diversification, mainly continuous ones, and still others are frequently proposed (Varadarajan & Ramanujam, 1987) as easier to compute or analyze than Rumelt's measures. However, before adopting any of these new measures, researchers have almost always attempted to see if they allow a classification of firms similar to that of Rumelt (Baysinger & Hoskisson, 1989; Montgomery, 1982; Varadarajan & Ramanujam, 1987). Despite this tacit recognition of the im-

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portance of Rumelt's measures, no study has rigorously compared the convergent and predictive validity of the new measures and Rumelt's measures; also, no study has investigated the ability of continuous measures to discriminate between Rumelt's results. Moreover, the robustness of Rumelt's measures themselves has never been subjected to construct validity tests across the three common sources of variance—differences in researchers, data sources, and methods. The broad objective of this study, therefore, was to thoroughly examine these two types of validity for Rumelt's and the more commonly used continuous diversification measures. Hoskisson and Hitt (1990: 469–470) give a more detailed discussion of the measurement problems involved in using diversification measures.

ISSUES IN MEASURING DIVERSIFICATION

Sources of Variance in the Use of Rumelt's Measures

Researcher-specific sources. The subjectivity inherent in Rumelt's measures may lead to variance across researchers. However, Rumelt's four broad categories of diversification—single, dominant, related, and unrelated—can be clearly defined by the "specialization" and "related" ratios. The specialization ratio, or the proportion of a firm's revenue that comes from its largest single business, is an entirely objective measure, especially if the same data source is used for information on sales in each business. The subjectivity lies with the related ratio, or the proportion of a firm's revenue coming from its largest group of related businesses. Different researchers may not agree as to the underlying logic that determines relatedness. It is thus likely that more inconsistencies will arise when researchers classify related and unrelated firms than when they address single- or dominant-business firms, if the same data source is used in different studies.

Data-specific sources. To compute the specialization and related ratios, researchers have to draw upon data sources that can provide sales information for different lines of business. However, different data sources often greatly vary in their degrees of detail. Consider, for example, the "10K" forms that publicly traded firms have to file with the Securities and Exchange Commission, and the TRINET data sources collected by Economic Information Systems. The 10K filings typically have industry and geographic segment data for a firm, but the data are at a fairly aggregate level that approximately corresponds to a two-digit Standard Industrial Classification (SIC) level of business definition. On the other hand, the Trinet data have sales information at the four-digit SIC level. To compute the related ratio, a researcher must identify the total sales of a firm's largest group of related businesses. A look at examples of Rumelt's related businesses shows that they clearly fall into distinct two-, or at most, three-digit SIC codes (Rumelt, 1974: 16). Since the broad lines of business reported in the 10K filings approximately correspond to two-digit SIC codes, the largest lines of business they show can be used for related ratios. But to compute that ratio from a fine-grained source like the Trinet data base, a researcher has to calculate the largest group of related businesses by aggregating firm sales across two-digit SIC codes and then selecting the two-digit code with the highest sales. Assuming that Trinet interprets SIC codes accurately, related ratios computed from 10K and Trinet may be comparable.

Computing the specialization ratio requires knowing the largest single business of a firm, which is typically described at the four-digit SIC code level. Since the lines of business reported in 10Ks are at the two-digit level, selecting the largest line of business from a 10K would be tantamount to selecting the largest group of related businesses, and one would end up computing the related ratio instead of the specialization ratio. To identify the largest single business of a firm, a researcher must, therefore, look into other data sources, like Moody's manuals and Standard & Poor's registers, but none of these other data sources offer detail comparable to that available in the TRINET data. In other words, although related ratios computed from coarse- and fine-grained data sources may be comparable, the same cannot be said for specialization ratios.

Method-specific sources. Recently, some scholars (e.g., Varadarajan & Ramanujam, 1987) have proposed a simpler, more objective version of Rumelt's measures. Noting that Rumelt's related businesses roughly correspond to two-digit SIC codes, Varadarajan and Ramanujam (1987) used two- and four-digit SIC codes to capture Rumelt's classification. Studying the variance introduced by modifying Rumelt's subjective methodology requires reclassifying a sample of firms using Rumelt's guidelines but defining related businesses by the largest two- or three-digit SIC codes.

The Validity of Continuous Measures and Rumelt's Measures

Montgomery (1982) observed that the value of the Herfindahl index, a continuous measure of diversification (Berry, 1975), increased nearly monotonically from Rumelt's single- to unrelated-business categories. Although this assessment provides some evidence of convergent validity between Herfindahl's and Rumelt's measures, for a more rigorous test a researcher needs to establish whether continuous measures exhibit convergent validity across different classifications, because diversification categories may vary across independently developed classifications through variations in data, researcher, or method. Apart from convergent validity, the current research focus on characteristics of discrete categories of diversification makes it even more important to establish if continuous measures can distinguish firms from different, individual diversification categories (indicating discriminating power) and not just from the combined means for the other categories, as Montgomery demonstrated. Also, for multimethod convergence, tests of convergent validity and discriminating power should be repeated for more than one continuous measure. Finally, since most diversification research has been directed to analyzing performance differences between firms with varying degree of diversity, the predictive as well as the convergent and discriminant validity of the measures used needs to be investigated to fully establish the robustness of these measures.

METHODS

Classifications

We developed our study group from the list of 191 firms constructed by Hawks (1984) by updating as of 1980 the classification of firms used by Rumelt (1974, 1978) and Montgomery (1979). Rumelt's list was based on a random sample of *Fortune* 500 firms, with each firm classified twice—in 1969 and in 1974—by the degree to which its businesses had related features. To investigate the effect of different data sources, we used the Trinet data base, which is much more detailed than the relatively coarse-grained data sources used by Rumelt and Hawks. Data were available in the Trinet data base on 149 of the 191 firms in Hawks's study. Since Hawks's classification had two categories in addition to the four of interest to us (the additional ones were related-linked and dominant-vertical), we collapsed the 149-firm subset of Hawks's sample into the four broad categories in the same manner Montgomery (1982) used. We named this classification *Rumelt-original.*

Next, we independently reclassified the 149 firms by exactly following Rumelt's methods and data sources, using 10K filings when possible where Rumelt used annual reports since line-of-business reporting was not prevalent at the time of his research. We called this second classification *Rumelt-reclassified.* These two classifications should differ to the extent different researchers interpret Rumelt's subjective methods differently but should not be influenced by different data sources or methods since both used Rumelt's method and data sources.

Next, using sales data from the Trinet data base, we reclassified the 149 firms by exactly following Rumelt's guidelines. Finally, once again using the Trinet data base, we reclassified the firms using a completely objective method that approximates Rumelt's guidelines. The objective and subjective classifications developed using the Trinet data base differed only in the computation of the related ratios. We computed the specialization ratios for both classifications as the ratios of the sales of the largest four-digit SIC business units to the total sales of the firms. The related ratios for the objective method were computed as the ratios of the sales of the largest two-digit business units to the overall sales of the firms. The related ratios for the subjective method were computed by following Rumelt's subjective methodology and matching the businesses of each firm into related units based on the business descriptions in Moody's (1980) and in the company annual reports that we had used to create the Rumelt-reclassified sample. We then matched these business descriptions to the two- and three-digit SIC business units of the companies reported by the Trinet data base and recomputed the related ratios. We named the subjective and objective groupings *Rumelt-subjective* and *Rumelt-objective.*

The group of firms was now classified so that there were three pairs; in the first, only researchers differed: the Rumelt-original and Rumelt-reclassified; in the second, only data differed: the Rumelt-reclassified and

Rumelt-subjective; and in the third, only method differed: the Rumelt-subjective and Rumelt-objective. We also had three other pairs of classifications in which inconsistencies could arise because of differences in (1) researcher and data (Rumelt-original and Rumelt-subjective); (2) method and data (Rumelt-reclassified and Rumelt-objective); and (3) researcher, method, and data (Rumelt-original and Rumelt-objective). Comparing the six pairs of classifications would allow us to investigate inconsistencies of varying degrees, starting with the lowest level, where the classifications differed in one element only, to the highest, where researcher, method, and data all differed.

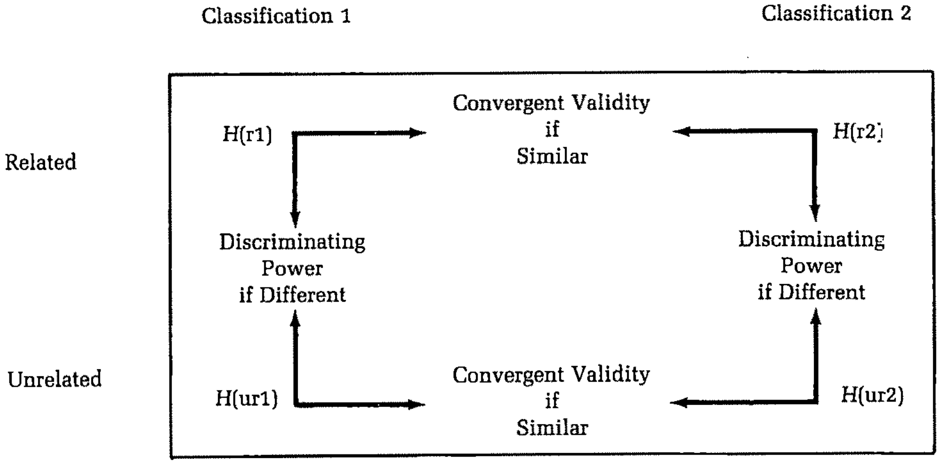
Analysis

Contingency table analysis allows computation of the Cramer's V-statistic, which has high values when convergent validity is present. Since we were comparing a small number of measures, we used a cutoff point of .60 for Cramer's V (Nunnally, 1978: 243–245) to determine convergent validity.

Convergent and discriminating power of continuous measures. Continuous measures are variants of the formula *diversification* $= \Sigma P_iW_i$, where P_i is the percent of a firm's ith business sales and W_i is an assigned weight summed over all a firm's businesses. We used the Herfindahl (Montgomery, 1982), weighted (Caves, Porter, Spence, & Scott, 1980; Chatterjee, 1990), and entropy indexes (Baysinger & Hoskisson, 1989) in this study. In the above formula, W_i is P_i for the Herfindahl index, ln $(1/P_i)$ for the entropy index, and d_{ih} for the weighted index, where d_{ih} is the distance of business i from the largest business h of a firm (cf. Chatterjee, 1990).

To illustrate discriminating power and convergent validity (Figure 1), we considered the average value of a continuous measure, H, for two diver-

FIGURE 1
Discriminating Power and Convergent Validity of Continuous and Categorical Measures


Classification 1
Classification 2
Related
Unrelated
H(r1)
Convergent Validity if Similar
H(r2)
Discriminating Power if Different
Discriminating Power if Different
H(ur1)
Convergent Validity if Similar
H(ur2)

sification categories, related (r) and unrelated (ur), independently developed by two classifications using Rumelt's measures. For discriminating power, *H*(r1) and *H*(r2) should be significantly different from *H*(ur1) and *H*(ur2), respectively, in a "pairwise" comparison, and for convergent validity, *H*(r1) and *H*(ur1) should be statistically similar to H(r2) and H(ur2), respectively.

Predictive validity. To test the ability of different measures to predict performance, we used return on assets (ROA; Montgomery, 1979; Rumelt, 1974) as the accounting measure of performance and Jensen's alpha and systematic risk (Lubatkin & Rogers, 1989) as the market measures of performance and risk, respectively. Jensen's alpha is a measure of the returns from holding a firm's stock that are greater or smaller than the return adjusted for systematic risk, or the risk affecting all businesses. We estimated systematic risk and Jensen's alpha over the 150 trading days prior to January 1, 1980, using the market model, $R_{it} - R_{ft} = \alpha_i - \beta_i (R_{mt} - R_{ft})$, where, R_{it}, R_{mt}, and R_{ft} are respectively the daily returns of an individual firm, the market as a whole, and the proxy for the risk-free rate on day t. The estimates of α_i and β_i are the Jensen's alpha and systematic risk for firm i. ROA is the operating profit divided by total assets, based on 1980 figures.

To investigate the predictive validity of the categorical measures, we tested how similarly the different classifications predicted performance differences across different categories. We compared the average systematic risk, Jensen's alpha, and ROA of the firms in the unrelated category with those of firms in the related category for all four classifications. The relatedness hypothesis suggests that unrelated firms should have higher values for systematic risk and lower values for Jensen's alpha and ROA than related firms.

To test the predictive validity of the continuous measures, we regressed the performance and risk measures on the three continuous diversification measures as: *performance/risk* = *a* + *b* (*diversification*) + *pharmaceutical dummy* + *e*. We used the pharmaceutical dummy to control for the possibility that the relatedness hypothesis may be largely explained by characteristics of firms in the pharmaceutical industry, which were present in Rumelt's (1974) sample (Bettis, 1981). We also tried a control for industry profitability, computed as the average ROA of the industries in which a firm participated weighted by the firm's percentage of total sales in those industries. This variable proved to be insignificant in explaining the variance of firm ROA. We retained the pharmaceutical dummy because it explained a significant portion of the variance in ROA.

RESULTS

The results of the convergent validity tests of Rumelt's measures using contingency table analysis were as follows: Cramer's *V* had values in excess of .60 when any two classifications had only one source of variation, be it data, researcher, or method. This result was also supported at a descriptive level by the high proportion of firms correctly classified when only data differed (.75), when only researcher differed (.83), and when only method differed (.85). However, when any two classifications had more than one source of variance, Cramer's V was well below .60, which suggests a lack of convergent validity between the classifications. The proportion of firms correctly classified also decreased to .61 when the two sources of variance came from either method or researcher in conjunction with data and reached a low of .56 when there were three sources of variance, from method, researcher, and data. Overall, the convergent validity of Rumelt's measure is strongest with only one source of variance.

Results presented in Table 1 demonstrate the discriminating power of the continuous measures. The continuous measures tested were highly capable of discriminating between different diversification categories when we used the same data base (Trinet) to compute the continuous and the categorical classifications, and they discriminated classifications a little less effectively when data sources differed. Judging by the number of significant pairwise differences, the entropy and the Herfindahl measures were more effective than the weighted measure in distinguishing diversification categories.

As regards convergent validity, the category means are significantly different from the overall means for all four classifications ($p < .01$; Table 1, top), a result consistent with those of Montgomery (1982). However, for a truer test of convergent validity, we compared the average values of each continuous measure for the same diversification category, from the overall means and pairwise between classification means across the four classifications used in this study. Table 2 gives results of this comparison. As the Fs reported in Table 2 indicate, the mean values of each diversification category for a particular continuous measure for each classification were significantly different from the overall mean of the four classifications. Further, this was true for all four diversification categories. However, when we compared the mean value of a particular continuous measure pairwise across any two classifications (Table 2, lower half), the classification means for the same diversification category were statistically indistinguishable for the single, related (except for the weighted measure), and unrelated categories, but not for the dominant category. Overall, the continuous measures are quite capable of distinguishing firms in the different Rumelt categories. Except for the weighted measure, the measures' convergent validity is good for the related and unrelated categories but not for the dominant category, where major differences arose when we compared either the Rumelt-original or the Rumelt-reclassified classifications—which were developed from coarse-grained data sources—with the Rumelt-subjective and Rumelt-objective classifications, which were developed from fine-grained data sources. No inferences should be drawn about the single-business category because we classified only one firm into this category using the Trinet data base.

The results presented in Table 3 support the relatedness hypothesis only for the market measures applied to the Rumelt-original and Rumelt-reclassified classifications. This finding indicates predictive validity for

TABLE 1
Results of Tests for the Discriminating Power of Continuous Measures Across Categories

	Rumelt-objective			Rumelt-subjective			Rumelt-original			Rumelt-reclassified		
Diversification Category[a]	Herfindahl Index	Weighted Index	Entropy Index	Herfindahl Index	Weighted Index	Entropy Index	Herfindahl Index	Weighted Index	Entropy Index	Herfindahl Index	Weighted Index	Entropy Index
Single	0.00	0.00	0.00	0.00	0.00	0.00	0.53	4.64	1.20	0.44	3.92	0.97
Dominant	0.28	1.99	0.68	0.42	3.06	0.98	0.76	7.02	2.02	0.61	5.20	1.59
Related	0.71	3.94	1.71	0.76	5.13	1.94	0.73	6.39	1.86	0.77	6.56	1.97
Unrelated	0.83	9.53	2.40	0.84	10.04	2.46	0.86	10.03	2.62	0.87	10.58	2.66
F	114.11**	100.72**	39.89**	101.16**	112.00**	43.12**	23.20**	26.47**	33.23**	39.93**	47.58**	39.24**
Unrelated-related	0.12**	5.58**	0.69**	0.08**	4.91**	0.53**	0.13**	3.64**	0.75**	0.10**	4.02**	0.68**
Unrelated-dominant	0.55**	7.53**	1.72**	0.42**	6.97**	1.48**	0.10	3.01**	0.60**	0.26**	5.38**	1.06**
Unrelated-single	0.83**	9.53**	2.40**	0.84**	10.04**	2.46**	0.33**	5.38**	1.42**	0.43**	6.66**	1.68**
Related-dominant	0.43**	1.94**	1.03**	0.34**	2.06**	0.96**	−0.03	−0.63	−0.16	0.16**	1.36	0.38**
Related-single	0.71**	3.94	1.71**	0.76**	5.13**	1.94**	0.20**	1.75	0.66**	0.32**	2.64**	1.00**
Dominant-single	0.28**	1.99	0.68	0.42**	3.06	0.98	0.23**	2.38	0.82**	0.17**	1.28	0.62**

[a] There was only one firm in the single-business category for both the Rumelt-objective and the Rumelt-subjective classifications.

** $p < .01$

TABLE 2
Results of Tests for the Convergent Validity of Continuous Measures Across Classifications

	Unrelated			Related			Dominant			Single-Business[a]		
Classification	Herfindahl Index	Weighted Index	Entropy Index	Herfindahl Index	Weighted Index	Entropy Index	Herfindahl Index	Weighted Index	Entropy Index	Herfindahl Index	Weighted Index	Entropy Index
Rumelt-original	0.86	10.03	2.62	0.73	6.39	1.86	0.76	7.02	2.02	0.53	4.64	1.20
Rumelt-reclassified	0.87	10.58	2.66	0.77	6.56	1.97	0.61	5.20	1.59	0.44	3.92	0.97
Rumelt-objective	0.84	10.04	2.46	0.76	5.13	1.94	0.42	3.06	0.98	0.00	0.00	0.00
Rumelt-subjective	0.83	9.53	2.40	0.71	3.94	1.71	0.28	1.99	0.68	0.00	0.00	0.00
F	2.80*	3.47*	3.42*	2.12†	11.01**	2.20†	17.83**	10.24**	10.72**	2.34†	1.11	2.04
Rumelt-reclassified–Rumelt-original	0.01	0.55	0.04	0.04	0.17	1.11	0.15	1.82	−0.43	−0.09	−0.72	−0.23
Rumelt-reclassified–Rumelt-objective	0.03	0.54	0.19	0.01	1.44**	0.03	0.19**	2.14	0.61**	0.44	3.92	0.97
Rumelt-reclassified–Rumelt-subjective	0.04**	1.05**	0.25**	0.06	2.62**	0.26	0.33**	3.20**	0.91**	0.44	3.92	0.97
Rumelt-original–Rumelt-objective	0.01	−0.01	0.15	−0.03	1.26**	−0.07	0.34**	3.96**	1.04**	0.53	4.64	1.20
Rumelt-original–Rumelt-subjective	0.03	0.50	0.22	0.02	2.45**	0.15	0.48**	5.02**	1.34**	0.53	4.63	1.20
Rumelt-objective–Rumelt-subjective	0.01	0.51	0.06	0.05	1.18	0.23	0.14	1.06	0.30	0.00	0.00	0.00

[a] There was only one firm in the single-business category for the Rumelt-subjective and Rumelt-objective classifications.

† $p < .10$

* $p < .05$

** $p < .01$

TABLE 3
Predictive Validity of Rumelt's Measures[a]

Diversification Category	Rumelt-original			Rumelt-reclassified			Rumelt-subjective			Rumelt-objective		
	Systematic Risk	Jensen's Alpha	ROA	Systematic Risk	Jensen's Alpha	ROA	Systematic Risk	Jensen's Alpha	ROA	Systematic Risk	Jensen's Alpha	ROA
Unrelated-related	.32**	−.00**	−.01	.27*	−.00**	−.01	.17	−.00	−.01	.15	−.00	−.03
F	3.57*	3.96*	1.02	2.27†	2.52†	1.70	1.21	1.90	1.07	1.03	1.92	2.41†

[a] Jensen's alpha was less than −.001 except for the significant results.

† p < .10

* p < .05

** p < .01

Rumelt's measures only if market measures of performance are used and Rumelt's methods and data sources are followed completely. If a classification is developed using Rumelt's guidelines but different data or methods, predictive validity breaks down.

The results of a test of the predictive validity of the continuous measures, presented in Table 4, suggest that only accounting performance (ROA) can be significantly explained by all three continuous measures of diversification, in support of the relatedness hypothesis. Overall, the results for the continuous measures suggest that these measures exhibit acceptable predictive validity only for accounting measures of performance. Further, of the three continuous measures, the entropy measure seemed to have the strongest explanatory power.

DISCUSSION

The findings of this study suggest that there are some problems in measuring diversification that have not been identified before.

Rumelt's Measures

Most studies that have used Rumelt's measures have either used his original sample or followed his method and data sources carefully. Our results suggest that the findings from these studies are quite comparable since the only variance in classification results from differences in researchers. The findings also suggest that the results of studies in which the same researcher has developed measures by varying either the data sources or methods are also comparable. Although measures with multiple sources of variance may not be as comparable, the nature of the differences is predictable, as we demonstrate below.

The proportion of firms correctly classified when researcher and data differed is .611. The product of the proportion of firms classified correctly when researchers differed (.833) and data differed (.752) is .62, which is very

TABLE 4
Predictive Validity of Continuous Measures[a]

Independent Variables	Dependent Variables								
	Systematic Risk			Jensen's Alpha			ROA		
Herfindahl index	−.01			−.07			−.12†		
Weighted index		.08			−.14			−.14*	
Entropy index			.02			−.09			−.18*
Pharmaceutical dummy	−.11	−.09	−.11	.07	.05	.06	.15*	.14*	.13*
F	0.91	1.37	0.92	0.76	1.75	1.03	3.21*	3.48*	4.48**
R^2	.01	.02	.01	.01	.02	.01	.04	.05	.06

[a] Estimated coefficients are standardized.

† $p < .10$

* $p < .05$

** $p < .01$

close to .611. The same computation holds where more than one factor differs between two classifications. This evidence is consistent with the hypothesis that the three individual factors act independently to determine the prior probability of correct classification when two or more factors differ. Thus, researchers can accurately predict the degree of misclassification that will occur when two or more factors differ without incurring the unpredictability of an interaction effect. This capability will allow the making of informed judgments as to whether multiple sources of variance can be lived with. Unfortunately, the predictive validity of Rumelt's measures proved to be less than ideal. Results did not support the relatedness hypothesis at all when we used accounting measures of performance—measures that were the basis of most early studies. Rumelt's measures showed better evidence of predictive validity with market measures of performance, but only for classifications in which researchers contributed the only source of variance. Our findings suggest that the results of studies that use Rumelt's measures with the same data and methods and market measures of performance are the ones that are directly comparable. Caution must be exercised when comparing the results of any other studies that use categorical measures.

Continuous Measures

The ability of the continuous measures to discriminate between the four different Rumelt categories reinforces the use of these measures because they preserve more information in the estimation process than categorical measures. However, the continuous measures demonstrated good predictive validity only when an accounting measure of performance was used and were unable to predict market measures. Of the three continuous measures, the superior consistency of the entropy measure in both the discriminating power and the predictive validity tests suggests that it is the most useful for studying within-group variance since it can be split into related and unrelated categories. The other measures may be best used in studies that need to measure overall diversity and changes in diversity.

The finding that the dominant, but not the related or unrelated categories, is sensitive to data sources provides an interesting insight into the usefulness of Rumelt's measures. This finding supports our earlier speculation that the specialization ratio may vary considerably across extreme types of data sources, whereas the related ratio, which can be approximated by the two-digit SIC code, does not. The relative frequencies of the off-diagonal and diagonal cells for the dominant, related, and unrelated categories when only data differed between two classifications further reinforces this speculation (results are available from the authors). For the dominant category, the misclassification rate was 50 percent, as compared to 40 and 30 percent for the related and the unrelated categories. The research implication of this finding is that classifications that are developed using different data sources are more useful in studying the related and unrelated categories than the dominant and single-business categories.

Finally, it would be very useful if, like the specialization and related ratios, different levels of the popular continuous measures could be associated with different diversification categories. If the magnitude of continuous measures can be shown to be stable over time for different diversification categories, even though the firms in the categories have changed, continuous measures could be used both for category and within-group analysis of variance. Some researchers (Palepu, 1985) have used the two components of the entropy measure for this purpose, but there is no evidence to suggest that the related and unrelated components of the entropy measure correspond to Rumelt's categories. It is instructive to note that the mean values of Montgomery's (1982) Herfindahl measure for the related and unrelated categories (.78 and .82) are quite similar for these categories in this study (.73 to .77 and .84 to .85). Although we would need to know the standard errors of Montgomery's Herfindahl measure to establish statistical similarity, this finding suggests a need for future investigation.

It may be worthwhile at this stage to speculate as to what may be contributing to the inconsistencies in the diversification performance literature. Hoskisson and Hitt (1990) suggested that part of the problem may be the result of measurements of performance, especially since there has been an increasing use of market-based performance measures in recent years. Their insight is particularly relevant in view of this study's findings that the predictive validity of different measures of diversification is sensitive to the performance measure used. Use of different measures of both performance and diversification doubles the possibility of errors in measurement.

There is also a suggestion that diversification is not stable over time (Keats, 1990; Ramanujam & Varadarajan, 1989), and more longitudinal research is needed to address this issue. Recently, Chatterjee and Wernerfelt (1991) and Hill and Hansen (1991) have made some efforts in this direction. Finally, there is always the issue of implementation. Many researchers (Chatterjee, 1986; Hill & Hoskisson, 1987) have suggested that related diversification will be successful only if it is implemented properly. Recently, Chatterjee, Lubatkin, Schweiger, and Weber (1992) found evidence that corporate cultural diversity can contribute to loss of value in related mergers. All these ideas seem to suggest that future research in diversification has to control for a number of contingencies to allow more confidence in its findings.

CONCLUSIONS

This study tried to quantify the impact of inconsistencies in the measurement of diversification on diversification-performance research. We suggest that the lack of strong convergent validity in Rumelt's classifications affects the dominant and single-business categories more than the related and unrelated categories, which lessens any problems in testing the relatedness principle. Further, the strong discriminating power of continuous measures to discriminate between Rumelt's categories justifies their increasing use in recent years. However, caution must be used when these measures are used to make predictions about performance because their predictive validity is contingent on the combination of performance and diversification measures used.

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ENTRANCE OF BLACKS AND WOMEN INTO MANAGERIAL POSITIONS IN SCIENTIFIC AND ENGINEERING OCCUPATIONS: A LONGITUDINAL ANALYSIS

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This longitudinal study of a national sample examined the effects of workers' gender and race on their entrance into managerial positions in public and private organizations over a period of four years. Results suggested that black workers had promotion advantages in both sectors and that women had promotion advantages in the private sector.

Empirical evidence reveals low representation of women (e.g., Auster, 1988; Hartmann, 1987; Kanter, 1977) and blacks in management (e.g., Davis & Watson, 1982; Killingsworth & Reimers, 1983). For the years covered by the current study, 1982–1986, approximately 30 percent of U.S. managers were women, and 3 to 4 percent were blacks (International Labor Office, 1986; Zweigenhaft, 1987: 37) but the overall representation in the labor force of these groups was 44 and 10 percent, respectively. Representation of women and blacks tends to be far lower in the upper echelons of organizations than in lower management. For example, women hold only 2 percent of senior executive jobs (Brenner, Tomkiewicz, & Schein, 1989). Similarly, of the 6,543 directorship positions in the *Fortune* 500, only 2.8 percent are occupied by women (e.g., Dipboye, 1987; cf. Kesner, 1988).

An overwhelming majority of the studies that address organizational promotion are cross-sectional (e.g., Cannings, 1988; Hartmann, 1987; Stewart & Gudykunst, 1982) rather than longitudinal; exceptions include Killingsworth and Reimers (1983), Lewis (1986), and Olson and Becker (1983). Conclusions from a cross-sectional study can be misleading if a trend exists in the years prior to the investigation. Stewart and Gudykunst (1982), for example, found that men had higher hierarchical levels than women but that women received a greater number of promotions. Thus, low representation figures may reflect organizations' past denial of women's and blacks' access

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to managerial positions, without necessarily suggesting that such practices were prevalent at the time of an investigation. Cross-sectional studies cannot separate egalitarian promotion systems introduced by employers in recent years from earlier wrongdoings because managerial positions examined at one point in time reflect both old and recent promotion policies implemented by organizational decision makers.

My main objective in this study was to separate recent from past discrimination practices concerning entrance into management by following a group of employees over a period of four years, 1982–86. I examined their promotion from nonmanagerial to managerial positions and estimated the extent to which gender and race played, ceteris paribus, a significant role in promotion practices. In order to account for equal starting points, I compared individuals who were equally qualified in terms of human capital variables, such as experience and education (Becker, 1964), and other individual characteristics; the individuals studied were also equally situated in terms of organizational sector and job definition in 1982 (England & McLaughlin, 1979). Because it compares individuals who occupied identical starting points in 1982, this estimation of discrimination is rather conservative and is unaffected by possible discriminatory processes occurring in the determination of positions prior to 1982. However, I attempted to address the loss of respondents over the period under investigation. Known as sample selection bias, this is one of the most serious problems associated with discrimination studies using longitudinal data, as it may result in biased estimates.

HYPOTHESES

The pertinent literature suggests that women and minority group members are less likely than others to establish managerial careers because of a number of not mutually exclusive factors, such as differential socialization (e.g., Noe, 1988), self-selection (e.g., England, 1984; McCarthy, 1986), tokenism (e.g., Fairhurst & Snavely, 1983; Kanter, 1977), statistical discrimination (e.g., Phelps, 1972), and exclusion practices (e.g., Brass, 1985; Kanter, 1977). It is likely that the low representation of women and blacks in management reinforces the widely held stereotype that women and minority workers are less qualified for managerial positions than other workers. Employers and co-managers therefore tend to prefer to see white males in managerial positions since they ostensibly possess more of the characteristics conducive to good management. Several empirical studies have confirmed this argument (Brenner et al., 1989; Dubono, 1985; Powell & Butterfield, 1989; Taylor & Ilgen, 1981; Zweigenhaft, 1987). Thus,

> *Hypothesis 1: Women and blacks are less likely to enter managerial positions than equally qualified men and whites.*

Empirical studies regarding the effect of gender on promotion to management have yielded inconclusive results, with some supporting the argument that gender has an effect (Cannings, 1988) and some not supporting it (Hartmann, 1987; Lewis, 1986; Stewart & Gudykunst, 1982). Furthermore, studies have concentrated on either private firms (e.g., Cannings, 1988) or public organizations (Lewis, 1986). Few have compared the public and private organizational sectors, despite theoretical indications of type of sector's importance in determining rates of entrance into management. In particular, researchers have assumed that organizations in the public sector are sensitive to their normative and legal environments. Studies have shown that political environments (Meyer, 1979; Warwick, 1975), public control (Holdaway, Newberry, Hickson, & Heron, 1975), and external legislation (Bansfield, 1975) influence public sector organizations. Civil rights and their implementation through Equal Employment Opportunity Commission programs and affirmative action laws have become major issues on the public agenda during the last three decades, leading to the expectation that their imprints will be found more often in public organizations than in private firms. Therefore,

> *Hypothesis 2: Women and blacks are more likely to enter managerial positions in the public sector than in the private sector.*

One crucial assumption should be made explicitly. Although it is often maintained that women and blacks are more likely than their male, white counterparts to make conscious decisions not to pursue managerial careers, research has as yet been unable to substantiate this proposition. In fact, some empirical evidence suggests that women are as likely as men to aspire to managerial positions (Bailyn, 1987; Shenhav, 1991; Sutton & Moore, 1985). Thus, for the purpose of this study I assumed that, irrespective of gender or race, all individuals held similar aspirations at the start of the research regarding promotion to managerial positions.

RESEARCH DESIGN

Data

The data used in the analyses are based on a unique longitudinal national survey conducted during the 1980s by the U.S. Bureau of the Census for the National Science Foundation. The survey was administered biennially from 1982 through 1986 (U.S. Bureau of the Census, 1987). The 1982 sample represented individuals defined as belonging to the civilian labor force and pursuing engineering, scientific, or related occupations. Clearly, the occupations addressed in this study are dominated by white men. Women constituted 11.6 percent and blacks 2.8 percent of the three million scientists and engineers in the United States in 1983 (National Science Board, 1985: 235). Although access discrimination, or discrimination affecting entrance, is clearly a problem that needs to be addressed in occupations in which women and blacks are underrepresented, I focused in this study on treatment discrimination, or discrimination affecting career progress, taking the presence of individuals in these occupations as given.

The census bureau survey was conducted by mail, with a telephone follow-up for nonrespondents. A total of 138,080 persons responded to the survey, constituting 82 percent of the men and 79 percent of the women in the survey panel. Follow-up surveys in 1984 and in 1986 were concerned primarily with updating the educational and work experience data collected earlier. In the analyses, I included individuals who were salaried employees, completed their questionnaires with no missing values for this study's variables, and were employed by private firms or public sector organizations. I excluded those who were already managers in 1982. After these selections, I ended up with 26,540 respondents in 1982. The longitudinal analyses drew on data on 13,509 individuals who responded in both 1982 and 1986.

Estimation

The group providing data for the present study was 49 percent smaller than the original group of 1982 respondents, and the survivors (the 1986 respondents) were more likely to be men and whites than women and blacks. In order to avoid the danger of sample selection bias, I used a method of correction known as the inverse of the Mills ratio (Heckman, 1980). Simply put, use of this variable controlled for differences between subjects in their chances of survival between 1982 and 1986. The inverse Mills ratio representing the probability of each person being included in the sample both times was incorporated into the "logit" regression analyses (Hanushek & Jackson, 1977) conducted at the individual level for time t_1 (1982, $N = 26{,}540$) and for the period $t_1 - t_2$ (1982–86; $N = 13{,}509$). The estimation of promotion differences was based on the assumption that the model was fully specified. In the absence of variables correlated both with gender or race and promotion, discrimination estimates might be upwardly biased.

The inverse Mills ratio was calculated on the basis of a "probit" equation (Hanushek & Jackson, 1977) estimating the probability of an individual's inclusion at time t_2. The following variables were included in the probit equation: wage, gender, race, years of work experience, marital status, having small children, holding an M.A. degree, holding a Ph.D. degree, number of work hours per week, age and age squared, and two dummy variables indicating the discipline area of a respondent's highest academic degree; all variables were based on 1982 data. A significant positive coefficient for the inverse Mills ratio would indicate that individuals who had survived the selection process over the period under investigation were more likely to have entered managerial positions than those who had dropped out. Conversely, a significant negative coefficient would indicate that individuals who had dropped out were more likely to have entered management than those who had survived. Heckman (1980) and Blau and Beller (1988) provide further discussion and an example of the use of the inverse Mills ratio.

Variables

Complete definitions of variables appear in the Appendix. The dependent variable, entrance, was dichotomous, and reflected entrance into or no entrance into a managerial position between 1982 and 1986. The two main independent variables were gender and race. I included several control variables in the equations to hold constant the possible effects of individual promotion-related characteristics on entrance into managerial positions: individual characteristics in 1982, change in individual characteristics during 1982–86, and job characteristics. Positive gender and race effects significantly greater than zero would indicate that women or blacks had greater chances of entering managerial positions than did men or whites having the same attributes at time t_1.

RESULTS

Table 1 presents the correlations among all the variables examined in the study. Table 2 presents descriptive statistics and the coefficients resulting from the logit regression analysis.

Results from further analyses are not presented in the tables owing to space limitations. In general, those data revealed that higher proportions of blacks and women were found in the public sector than in the private sector. In 1982, women constituted 30 percent and blacks 7 percent of those employed in public institutions. The equivalent figures in the private sector were 18 and 5 percent. Higher proportions of men were in managerial positions in both sectors: 36 percent of men versus 23 percent of women in the private sector, and 39 percent and 26 percent, respectively, in the public sector. Surprisingly, in the public sector, almost identical proportions of black and white workers were found in managerial positions: 35 percent of whites versus 23 percent of blacks in the private sector, but 36 and 35 percent, respectively, in the public sector.

Examining data on those who entered managerial positions between 1982 and 1986, I found differences between the private and public sectors. By and large, identical proportions of women and men were promoted to management in the private sector (21 percent), but the proportions differed in the public sector, with 23 percent of men and 16 percent of women promoted to those jobs. On the other hand, blacks enjoyed a slightly higher promotion rate than whites in the public sector (23 versus 21 percent), but not in the private one (17 percent for blacks and 21 percent for whites). However, these comparisons are insufficient to corroborate the existence of discrimination; logit analyses were necessary to compare the promotion rates of individuals who were equally qualified and equally situated.

Table 2 presents the logit coefficients for two equations each computed for employees in the two sectors; these are (1) a full equation including all the independent individual variables, since the discrimination estimation assumes otherwise identical characteristics among compared individuals

TABLE 1
Correlations[a]

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. Change to manager																								
2. Sector	−.01																							
3. Experience	−.01*	−.09*																						
4. Marital status	.04*	.02*	.16*																					
5. Children	.01*	.00	.02*	.06*																				
6. M.A.	.04*	.00	−.05*	−.01*	−.01																			
7. Ph.D.	−.02*	−.14*	.01	.01	.01	−.22*																		
8. Social sciences specialization	.00	−.13*	−.04*	−.01	.01	.00	.14*																	
9. Engineering specialization	−.04*	.15*	.10*	.06*	−.01	−.11*	−.15*	−.21*																
10. Change to single	.01	−.00	−.02*	.07*	.01	−.01	.00	−.00	−.03*															
11. Change to married	.01	.01	−.15*	−.39*	−.04*	.00	−.02*	.00	−.02*	−.05*														
12. Children change	−.02*	.03*	−.21*	.02*	−.11*	.01	−.02*	.01	−.00	−.04*	.13*													
13. Education change	−.01	.00	−.03*	−.03*	−.00	−.02*	−.01*	−.00	−.00	−.00	.01	−.01												
14. Race	.01*	.04*	.04*	.03*	−.01*	−.02*	.02*	−.00	.04*	−.02*	−.00	−.00	−.00											
15. Gender	.02*	.13*	.23*	.19*	.04*	−.04*	.02*	−.05*	.25*	−.03*	−.08*	−.09*	−.01	.01										
16. Research	−.05*	−.19*	−.02*	−.01	.01	.02*	.35*	.05*	−.12*	.00	−.01	−.00	−.00	−.00	−.06*									
17. Technical writing	.00	−.09*	−.01*	−.03*	−.01	.02*	.00	.08*	−.05*	.02*	.02*	.01	.00	.00	−.06*	−.07*								
18. Design	−.04*	.10*	.04*	.03*	.01	−.02*	−.09*	−.09*	.29*	−.01	−.01*	−.01	.01	.01	.10*	−.14*	−.08*							
19. Quality control	−.01	−.03*	−.01*	−.02*	.01*	−.03*	−.05*	−.03*	−.01*	−.01	−.01	−.00	.01	−.03*	−.03*	−.09*	−.05*	−.10*						
20. Production	.06*	.02*	−.01	.02*	−.01	−.07*	−.11*	−.05*	.07*	−.01	−.00	.01	−.01	.01	.06*	−.15*	−.08*	−.16*	−.11*					
21. Marketing	.05*	.10*	.00	.01	.01	−.05*	−.07*	.01*	−.10*	.01*	.01	−.01	.00	.02*	.02*	−.10*	−.06*	−.11*	−.07*	−.12*				
22. Statistical work	.01	−.03*	−.02*	−.02	−.00	.02*	.02	.14*	−.12*	−.01	.01	.02	−.00	−.00	−.04*	−.08*	−.04*	−.08*	−.06*	−.09*	−.06*			
23. Consulting	−.01	.05*	.05*	.05*	.02*	.05*	−.01*	.00	.04*	−.00	−.01	.00	−.00	.02*	.04*	−.10*	−.05*	−.10*	−.07*	−.11*	−.08*	−.06*		
24. Computer applications	.00*	.05*	−.06*	−.04*	−.02*	.01	−.04*	.01*	−.14*	.01*	.02*	.01	−.01	−.01	−.10*	−.10*	−.06*	−.11*	−.07*	−.12*	−.08*	−.06*	−.08*	
25. Other activity	−.01	−.17*	−.02*	−.03*	−.01	.03*	.01*	.03*	−.12*	.00	−.00	.00	−.00	−.02*	−.13*	−.07*	−.04*	−.07*	−.05*	−.08*	−.05*	−.04*	−.05*	−.06*

[a] N = 13,509.

* $p < .05$, two-tailed test

** $p < .01$, two-tailed test

TABLE 2
Means, Standard Deviations, and Results of Logit Analyses[a]

	Private Sector						Public Sector					
			Equation 1		Equation 2				Equation 1		Equation 2	
Variables	Means	s.d.	*b*	s.e.	*b*	s.e.	Means	s.d.	*b*	s.e.	*b*	s.e.
Dependent												
Entrance	.21	.41					.21	.41				
Independent												
Gender	.82	.38	−.52**	.10	−.41**	.09	.70	.46	.06	.13	.07	.13
Race	.95	.24	−.69**	.19	−.46**	.16	.92	.28	−1.40**	.31	−1.30**	.27
M.A.[b]	.31	.46	−.21**	.08	−.11	.07	.34	.47	.10	.11	.12	.11
Ph.D.[b]	.05	.22	−1.20**	.19	−.90**	.15	.17	.37	−.44*	.19	−.36*	.17
Experience	14.30	10.30	.01*	.00	.01*	.00	14.30	9.60	.01	.01	.01	.01
Marital status	.78	.52	−.14	.11			.73	.30	−.02	.15		
Children	.25	.43	−.03	.07			.23	.42	−.16	.12		
Change to single	.02	.14	.01	.13			.02	.15	−.05	.26		
Change to married	.04	.19	.23	.12			.04	.19	−.18	.24		
Education change	.00	.04	−.51	.62	−.50	.62	.00	.04	.20	1.10	.27	1.12
Children change	.05	.23	−.31**	.10			.05	.23	−.42	.20		
Social sciences[c]	.04	.19	.08	.14	.05	.14	.12	.32	.01	.15	.01	.15
Engineering[c]	.45	.50	−.87**	.09	−.73**	.07	.23	.42	−.46**	.16	−.40**	.15
Research[d]	.07	.26	−.72**	.24	−.61*	.24	.23	.42	−.46	.28	−.37	.26
Technical writing	.03	.17	−1.10**	.22	−.92**	.21	.08	.27	−1.10**	.37	−.98**	.32
Design	.14	.35	−.69**	.22	−.58**	.22	.05	.21	−.42	.27	−.35	.25
Quality control	.06	.24	−.34	.21	−.23	.20	.08	.27	−.30	.27	.20	.24
Production	.16	.37	.10	.20	.12	.20	.13	.34	.76*	.37	.81*	.37
Marketing	.11	.31	−.34	.23	−.24	.22	.02	.13	−1.00**	.31	−.90**	.29
Statistical work	.04	.20	−.81**	.22	−.68**	.21	.07	.25	−.22	.32	−.15	.31
Consulting	.08	.27	−.93**	.22	−.76**	.21	.04	.18	−.46	.30	−.37	.27
Computer applications	.09	.28	−.93**	.31	−.77**	.21	.07	.25	−.62*	.30	−.50	.27
Other activity	.02	.13	−1.40**	.23	−1.20**	.22	.14	.35	−1.40**	.30	−1.21**	.26
Mills ratio	$-.93 \times 10^{-11}$	.78	−5.20**	.67	−4.00**	.44	$.29 \times 10^{-9}$	.78	−5.10**	1.00	−4.60**	.79
Constant			4.70		3.19				4.13		3.39	
N	20,806		10,517		10,517		5,734		2,992		2,992	
χ^2			274.5		256.0				118.0		112.0	

[a] The number of cases for means differs from the number of cases for coefficients. The descriptive statistics are based on the representative data in 1982, before the number of cases was reduced in 1986. Whereas the 1982 group was unbiased, the reduced group was biased and required correction.

[b] Reference category is "B.A."

[c] Reference category is "all other disciplines."

[d] Reference category for this and all following variables is "development."

* $p < .05$, two-tailed test

and (2) a partial equation excluding family-related variables, which are arguably irrelevant to promotion to managerial positions and could bias estimates of discrimination.

The results of the logit analyses differed for gender and race. Surprisingly, the coefficient for race was negative in both private and public organizations. This finding suggests that, in general, black workers enjoyed better promotion opportunities than equally situated white workers in both sectors. Better promotion opportunities for blacks were also consistently found in separate analyses conducted for men and women (data are available upon request). In order to study the hypothesis regarding the sector effect, I conducted a test for differences in the regression coefficients of the public and private sector equations. The test, computed by the method Gottfredson suggested (1981: 547), yielded a *t*-statistic of 2.9, which suggests that the coefficient for race is significantly higher in the public sector. In other words, despite the fact that blacks enjoyed higher promotion opportunities than whites in both sectors, these opportunities were better in the public sector. However, workers' gender was significant in the private sector only where women enjoyed better promotion opportunities than equally qualified and situated men. The test for the differences between the public and private sectors regarding gender yielded a *t*-statistic of 3.5, suggesting that women's opportunities were significantly better in the private sector than in the public sector. Further analyses suggested that this finding was true for white women compared with white men but not for black women compared with black men.

It should be noted that the negative coefficients obtained in both sectors for the inverse Mills ratio suggest that, among individuals with otherwise similar characteristics, including race and gender, those who dropped out of the study were more likely to enter managerial positions than those who survived. It is important to note that there were no differences between the partial and the full equations regarding gender and race.

For purposes of comparison, I also conducted cross-sectional analyses, using the same variables, for the 1982 data. In the private sector, the gender and race coefficients were positive and significant. That is, women and blacks were less likely to be promoted to managerial positions than their male, white counterparts. In the public sector, the gender coefficient was positive and significant, whereas the race coefficient was insignificant. Obviously, these results differ substantially from those obtained via the longitudinal models. Had I relied on cross-sectional data only, I could have wrongly concluded that discrimination existed against women in both sectors, and against black workers in the private sector. The longitudinal models are undoubtedly superior to the cross-sectional ones. They compare promotion rates between 1982 and 1986 for workers who were equally situated and qualified in 1982, whereas the cross-sectional models do not control for such equal starting characteristics. Thus, the frequent reliance on cross-sectional models in previous research may result in estimations that reflect past wrongdoings rather than contemporary processes. The differences between the two models' findings demonstrate the strength of the current research.

DISCUSSION

At the outset of this article, I suggested that longitudinal data may shed some light on previous conflicting results regarding gender and racial differences in promotion to managerial positions during the 1980s. I also suggested that minority workers enjoy more advantages in promotion in the public sector than in the private sector. No support emerged for the first hypothesis, that managerial opportunities are less available to women and blacks than to men and whites. On the contrary, with the exception of women in the public sector, women and blacks enjoyed better promotion opportunities than equally qualified and situated white male workers. The prediction of the second hypothesis regarding promotional advantages in the public sector was substantiated only for race. Women enjoyed better opportunities than men in the private sector but not in the public one.

However, managers must not take these results as evidence that affirmative action is no longer necessary. Although direct data are lacking, it is most likely that blacks and women achieve managerial positions partly because of firms' efforts to find minority candidates for managerial positions. But no less important, the results call for four notes of caution concerning equalized opportunities. First, the promotional advantage of women and blacks by no means indicates the absence of a white male advantage in occupying managerial positions. The longitudinal model examines whether people with similar qualifications continue to be promoted equally over time. However, in most cases, white men are found in managerial positions more frequently than their black or female counterparts because of better starting points. Evidently, during 1982–86, more men than women in both sectors and more whites than blacks in the private sector were promoted to managerial positions.

Second, the results do not imply that discrimination does not exist. To be sure, the models encompass women-to-men and black-to-white comparisons of promotion for workers with identical starting characteristics in 1982 who experienced similar changes in those characteristics between 1982 and 1986. However, possible discriminatory processes occurring before and during the determination of the characteristics in 1982 do not affect the gender and racial estimates derived from these models. In other words, the models estimate treatment discrimination occurring between 1982 and 1986 only, given the qualifications and conditions prevalent in 1982. Moreover, by focusing on treatment discrimination between 1982 and 1986, the study left out discrimination that took place in the entrance into the lucrative science- and engineering-based occupations studied, in which women and blacks are underrepresented.

Third, the higher probability of women and blacks dropping out of the sample studied is not only a methodological issue but also a substantive one. Although dropping out could have been the outcome of self-selection and a deliberate decision on the parts of women and black workers to quit organizations, possibly because of better promotion opportunities elsewhere, dropping out could also result from discrimination. Combined with the finding that firms are attempting to overcome past discrimination practices by promoting women and blacks who remained in the organization disproportionately to their numbers and qualifications relative to whites and men, the higher drop-out rate for women and blacks may indicate an alternative form of discrimination. If this possibility is true, it is even more severe in the case of gender, because women who dropped out were more likely to be promoted to management than women who survived in the sample. There were no differences among blacks between survivors and nonsurvivors.

Fourth, managers should pay attention to the fact that among the three groups, black women, white women, and black men, the first has achieved the least. Although black women in science and engineering have been through an arduous selection process, the gender advantages for women in the private sector occur for white rather than black women. I suggest that affirmative action should be implemented more thoroughly for the latter group.

In light of these notes, I also suggest that the current advantages minority workers have be considered as temporary until the proportions of minority and majority workers in management reach parity. Also, I suggest that affirmative action officers could help the scientific community to study discrimination by collecting types of data that are not readily available. For example, this study has shown that blacks and women have higher attrition rates. Unfortunately, there is neither information on the causes of this attrition nor information regarding the readiness of different groups to be promoted to management. Such data might refine future research conclusions regarding discrimination practices. Finally, the results of this study may well be peculiar to the scientific and engineering labor market, in which case they cannot be generalized to other segments of the market. Further study needs to carefully examine this trend within other groups of workers.

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APPENDIX
Definitions of Variables

Dependent Variable

Entrance	1 = nonmanagerial position in 1982 and managerial position in 1986 0 = nonmanagerial position in 1982 and 1986

Independent Variables

Gender	1 = man 0 = woman
Race	1 = white 0 = black
M.A.	1 = M.A. in 1982 0 = otherwise
Ph.D.	1 = Ph.D. in 1982 0 = otherwise
Experience	Years of professional experience in 1982
Marital status	1 = married in 1982 0 = otherwise
Children	1 = had child 5 years old or under in 1982 0 = otherwise
Change to single	1 = married in 1982 and single in 1986 0 = no change in marital status

Change to married	1 = single in 1982 and married in 1986 0 = no change in marital status
Education change	1 = acquired a higher degree between 1982 and 1986 0 = otherwise
Children change	1 = children born between 1982 and 1986 0 = otherwise
Social sciences	1 = social science specialization 0 = all other disciplines
Engineering	1 = engineering specialization 0 = all other disciplines
Research	1 = performed a research job in 1982 0 = otherwise
Technical writing	1 = engaged in technical writing in 1982 0 = otherwise
Design	1 = performed a design job in 1982 0 = otherwise
Quality control	1 = performed a quality control job in 1982 0 = otherwise
Production	1 = performed a production job in 1982 0 = otherwise
Marketing	1 = performed a marketing job in 1982 0 = otherwise
Statistical work	1 = engaged in statistical work in 1982 0 = otherwise
Consulting	1 = performed a consulting job in 1982 0 = otherwise
Computer applications	1 = engaged in computer applications in 1982 0 = otherwise
Other activity	1 = engaged in any other activity in 1982 0 = otherwise

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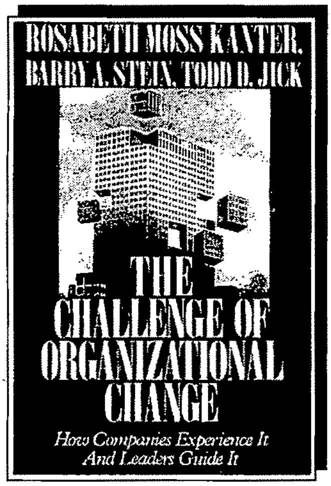
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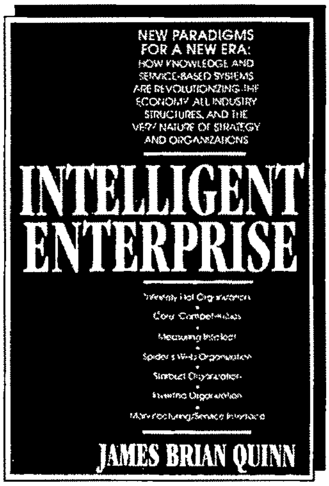
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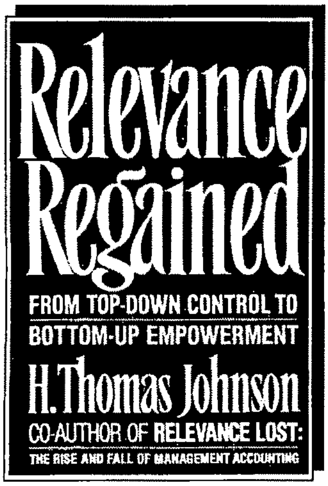
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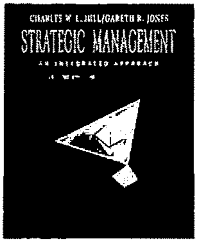

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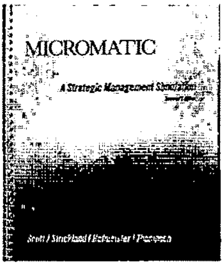
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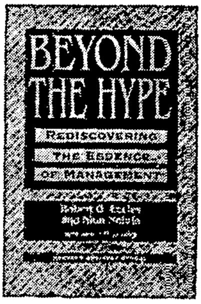

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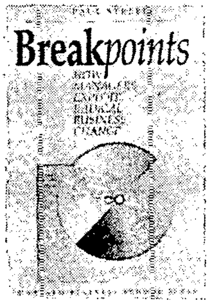

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